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A Public versus a Private Canada Pension Plan:

A Survey of the Economics

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Abstract

Privatization, generally defined as a gradual phase-out of the public CPP combined with an expanded system of either mandatory or voluntary individually-managed retirement accounts, has received increased attention recently, particularly following the introduction of such a system by the Pinochet regime in Chile in 1981. Proponents of privatization argue that it would give Canadians direct control over their assets and greater certainty of receiving a return on these assets. They argue that a fully funded public CPP is not a solution because governments cannot be trusted with large sums of money that would likely be misspent.

Arguments in favour of a public CPP generally rest on its unique ability to provide social insurance and thereby overcome market failures, its low administration costs, its comprehensiveness and its portability.

The paper provides an economic analysis of these issues. The conclusion reached is that a well-managed public CPP can effectively deal with all of the concerns of those favouring privatization, thereby maintaining the many benefits of a public program. In addition, it is argued that privatization does not deal with the key problem presently besetting the CPP: the liabilities resulting from past promises that must be funded publicly regardless.

Sommaire

La privatisation du Régime de pensions du Canada, qu'on définit généralement comme une élimination graduelle du système public de prestations combinée à un système obligatoire ou discrétionnaire de comptes gérés par les adhérents sur une base individuelle, suscite de plus en plus d'attention ces derniers temps, surtout depuis l'adoption d'un tel système par le régime Pinochet, au Chili, en 1981. Ceux qui favorisent la privatisation estiment que les Canadiens jouiront ainsi du contrôle direct de leurs actifs et d'une plus grande certitude d'obtenir un rendement approprié. Ils affirment qu'un régime public à capitalisation intégrale ne constitue pas une solution, car on ne peut pas faire confiance aux gouvernements pour gérer judicieusement de grandes sommes d'argent.

Ceux qui favorisent un régime public, par contre, font généralement référence à la sécurité sociale que seul le gouvernement peut assurer à cet égard, en évitant les aléas du marché, aux frais d'administration peu élevés, ainsi qu'à l'universalité et à la transférabilité d'un tel régime.

Le présent document constitue une analyse économique de la question. On y conclut qu'un RPC public bien administré peut répondre efficacement à toutes les préoccupations des partisans d'un régime privé tout en conservant les nombreux avantages d'un régime public. En outre, on y indique que la privatisation ne permettra pas de résoudre le problème majeur auquel le RPC est actuellement confronté : les

obligations financières contractées en vertu des engagements antérieurs et qui doivent être assumées par l'État, quelles que soient les orientations futures du régime de retraite.

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Executive Summary

Arguments Made by Proponents of Privatization

Proponents of privatization argue first, that a private system would be fully funded and would therefore earn a higher rate of return. Second, they claim that a private system would make the relationship between individual contributions and benefits more transparent. Canadians would have an ownership claim on their accounts and would therefore have greater confidence that they would receive a return on their retirement savings. Third, they argue that a large public fund could be wasted in low return investments, and would encourage politicians to increase benefits under the CPP for political gain, rather than worry about future generations. They claim that cheap CPP financing would encourage governments to increase spending. Because of these political risks, they argue that the CPP is not secure and might not exist when people would need it.

Assessment

It is true that if the CPP were to remain approximately pay-as-you-go (PAYGO), then the effective return on contributions would eventually fall below market returns. However, this could be solved simply by moving the public CPP to fuller funding. Privatization is not necessary to achieve this.

It is also true that the large CPP unfunded liability generated by PAYGO financing would eventually entail large contribution rate increases. However, privatization does not, in itself, solve this problem. The government cannot simply walk away from the CPP benefits which Canadians have, to date, been promised. They have to be paid for by someone. The cost of these promised benefits would require a contribution rate of close to 6 per cent until about year 2030, even if no new pension rights were being accrued. This means that working Canadians between now and 2030 would still be paying twice -- once for their own private plans and again for the CPP benefits already promised to current and near-retirees. This is the same burden that would be imposed if we immediately moved to full funding of the CPP.

Proponents of a Chilean-style privatized system argue that its use of dedicated accounts would make the link between contributions and benefits more transparent, and would give Plan participants a greater sense of security regarding their future benefits because individuals would "own" the funds in their accounts. This, however, is not really an argument for privatization, but rather for switching from a defined benefit to a defined contribution plan. A defined contribution plan could as easily be public as private. While defined contribution plans may be more transparent in terms of individual assets, a defined benefit plan like the CPP has the advantage of providing greater income replacement security during retirement.

The problem of political risks must be taken seriously. They can be overcome by putting in place institutions and rules of governance to ensure efficient management of

the CPP. This applies particularly to the investment of CPP funds and the need to avoid using the CPP as a cheap way to finance expenditures .

Arguments in Favour of a Public System

Arguments in favour of a public system rest upon its ability to provide social insurance and thereby overcome market failures, its low administration costs, its comprehensiveness and its portability. Opponents of privatization argue that the transition to a private system would be difficult as some people would end up paying twice, and that individuals would bear more risks in a private defined contribution system.

Assessment

Pension systems provide a number of types of insurance. The CPP insures against the risk that people will live long enough to exhaust their savings. It insures against disability risk and contains child-caring drop-out provisions. Markets cannot efficiently provide these types of insurance through personal savings vehicles. This is by no means a unique case: for example, markets do not effectively protect the environment or provide health insurance. Governments have a legitimate role in these areas and also in pension provision. Clearly, however, this role must be fulfilled in a sensible manner.

To understand why insurance services can be provided by the CPP but not by private markets, it is useful to recall how a pension differs from other types of retirement income. A *pension* is the guaranteed payment of a *lifetime income*. This lifetime pension income is available as long as a person (or a spouse) lives. This provides insurance against the risk that, in the absence of a public system such as the CPP, a person will live so long that his or her assets will be exhausted and he or she will be destitute. A public pension system does this by pooling the risks of all plan participants, and is thus fundamentally different from other forms of personal saving that do not provide this insurance.

Private markets do not provide this insurance, which is an essential feature of a public CPP, because individuals with relatively short life expectancies would have a lower than average demand for annuities (which provide a permanent pension) at the average actuarially fair price. On the other hand, insurers would like to sell annuities to exactly these people. Demand would be greatest from individuals with relatively long life expectancies who represent the greatest risk from insurers' perspectives. This problem, called *adverse selection*, stems from the fact that individuals have more information regarding their life expectancy than insurers. The resulting inability of annuities markets to fully meet individual's pension needs has been very apparent in the Chilean privatized system. Rather than buy inefficient market annuities, most Chileans have opted for phased withdrawals of their assets after retirement which do not insure against the risk of living long enough to exhaust one's savings.

Occupational pension plans are a way that individuals can provide themselves with some degree of insurance against the risk of living long . However, the advantage of a public system is that it pools risks over the entire working population, while occupational plans must pool over a much smaller membership base. Occupational plans cover fewer than half the persons covered by the C/QPP. A public system also has the advantage of providing full portability of benefits, while the portability of occupational plans is uneven. A public plan can index benefits to inflation, something that may be more difficult for an occupational plan.

The CPP has much lower administration costs than would apply under a private system. In 1994, Canadian life insurance expenses per policy were 28.2 times higher than CPP expenses per plan participant . Trusteed pension plan expenses per participant were 12.9 times higher than those of the CPP. Available estimates on administration expenses for Chile and private sector pension plans in the United States are consistent with the Canadian private-public cost ratios.

Higher private costs can be attributed to a number of factors. Among the most serious is that a private system cannot take advantage of the economies of scale available to a national public plan. Costs are also increased by the need to attract more customers through advertising and sales personnel, because the collection of contributions and delivery of benefits represents the kind of well-defined task that lends itself to more efficient public supply, and because individual choice with many small accounts is costlier than group choice. In Chile, these types of inefficiencies have forced the state to heavily regulate the private market.

Privatization would still mean that at least one generation would have to pay more than it received from the system. Any privatization option would involve a gradual phase-out of the existing CPP that would still guarantee current recipients as well as older workers nearing retirement their full benefits. Younger workers would still have to pay a tax to finance the CPP benefits already promised, and would receive no corresponding future benefits.

A privatized system featuring individual accounts would represent a switch from a defined benefit to a defined contribution system. A defined contribution system would provide less certainty to individuals regarding their retirement income. It would expose participants to the risk that the value of the assets in their accounts might be unusually low at retirement, leading to a lower retirement income.

In summary, privatization would not solve the key problems facing the CPP, but would sacrifice the CPP's provision of social insurance and low administration costs. For these reasons the CPP should continue to be public.

1. Introduction

The Canada Pension Plan (CPP) is a compulsory, public, defined benefit plan financed presently on an approximate pay-as-you-go (PAYGO) basis. Since its introduction in 1966, contribution rates have been below the actuarially fair (full cost) levels, resulting in a large unfunded liability, estimated to be 70 per cent of GDP. The existence of this unfunded liability means that contribution rates will eventually have to rise above the full cost levels. James *et al* (1995) concluded that maintaining PAYGO would be economically costly for future generations and that economic benefits would result from moving to fuller funding.

Proponents of privatization argue that the flaws of the existing public system are so great that they cannot simply be solved by a reform such as fuller-funding. Privatization, generally defined as a gradual phase-out of the public CPP combined with an expanded system of either mandatory or voluntary individually-managed retirement accounts, has received increased attention recently in the context of the public debate on CPP reform.

This paper analyses the pros and cons of public and private systems. In Section 2 we outline a number of privatization options that have been proposed or implemented in other countries, and their rationales. In Section 3 we conduct a qualitative assessment of private pension systems. In Section 4 we evaluate the criticisms of public systems made by proponents of privatization and review the case for a public system. In Section 5 we summarize our qualitative assessment of a continuum of reform options. In Section 6 we outline a model-based framework that would enable us to quantify the economic effects of private versus public systems. This framework would be the basis for future technical work. In Section 7 we draw some preliminary conclusions.

2. Privatization Rationales and Options

Proponents of privatization generally offer the following rationales in support of their position. First, the existing public PAYGO system is unsustainable owing to the large increases in future contribution rates made necessary by the large unfunded liability. Second, under a public system there is always the political temptation to enrich benefits and pass on the cost to future generations. A corollary of this is the idea that, under a privatized system individuals would have a greater certainty that they would actually receive a return on their retirement savings. A system of individual accounts (frequently a feature of privatization options) would be more transparent than the current defined benefit system. Third, privatization would eliminate the economic inefficiencies created by a PAYGO plan. These are principally identified as reduced national saving generated by unfunded liabilities, and labour supply distortions generated by payroll taxes. Finally, there is the idea that private choice is inherently superior to public choice because of the greater efficiency of competitive market-based solutions.

Conceptually, privatization of the pension system could take different forms. It can range from outright abolition as proposed by Robson (1996) in Canada and Ferrara

(1980) in the United States, to the privatization of specific functions such as fund portfolio management. Below we describe three examples embodying different degrees of privatization, namely the Robson proposal, the Chilean system and The World Bank Policy Research Report proposal.

2.1 A Phase-Out Proposal

Robson places particular stress on the sustainability theme in arguing for the eventual phase-out of the CPP. As noted above, the CPP unfunded liability implies that contribution rates will eventually have to rise above the full cost levels. Robson argues that once this occurs, the contract between generations will break down, with future workers being unwilling to accept paying permanently more in contributions than they receive in benefits. He argues that existing CPP commitments should be prefunded through a combination of contribution rate increases and benefit cuts. In advocating fuller-funding he does not differ from James *et al*. Simply pre-funding the existing CPP, however, does not go far enough in his view because of the ever-present danger that future governments would be tempted to enrich benefits thereby creating a new set of intergenerational transfers. He thus advocates a gradual wind-up of the Plan and its replacement with greater reliance on RRSPs and occupational pension plans. The specific scenario Robson considers has the following features:

- disability benefits are separated from the CPP;
- the retirement age increases to 70 over a 20-year period beginning in 1998;
- new benefits accruing after 1998 are scaled down by 40 per cent;
- no new benefits accrue after 2008;
- contribution rates rise to 7.5 per cent in 1997 and remain there until 2008;
- the unfunded liability is paid off over the period 2008-2038 by imposing a flat personal income tax surcharge of 2.5 per cent, or a payroll tax of 4.5 per cent; and
- provincial governments would determine whether or not they wished to mandate contribution to RRSP accounts.

The Robson proposal, with its agnosticism regarding mandating RRSP contributions, effectively amounts to abolition of the CPP and letting individuals save, if they wish , through RRSPs or occupational plans. Abolition represents a more radical option than the Chilean system which continues to mandate contributions. Robson does not advocate abolition of OAS/GIS (or the Seniors' Benefit, which will replace OAS/GIS in 2001). He argues that OAS/GIS is an income support program that differs fundamentally from CPP in that its "generosity is a moral and political judgement geared in large part to the prosperity of the taxpaying population."

2.2 The Chilean System

Diamond (1996) provides a useful summary of the Chilean system. Its main features are:

- a phase-out of the defined benefit social security[1] system by the Pinochet regime beginning in 1981;
- a mandatory minimum 10 per cent contribution rate on pensionable wages for retirement saving plus additional amounts for disability and survivors insurance, administrative costs and mutual fund management profits;
- contributions are locked in personal accounts with private, quite heavily regulated mutual funds until the age of retirement; and
- upon reaching the retirement age, individuals may opt for phased withdrawals or convert their accounts into a market annuity[2]. Upper limits are placed on the amounts of the phased withdrawals.

The Chilean system continues to feature a separate flat benefit component designed to reduce old age poverty. This component features a low level of benefits and is not indexed to inflation. Benefit enrichments occur occasionally as a result of arbitrary political decisions.

2.3 The World Bank Policy Research Report View

The World Bank Policy Research Report "Averting the Old Age Crisis" argues that an ideal old age security system should be comprised of three "pillars":

- a public pillar providing a universal flat benefit that would have the limited objective of reducing old age poverty. This would be much like Canada's OAS/GIS, and would be financed out of general taxation. Because it would not be earnings related, there would be little connection between individual contributions and benefits. The

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1 The term "social security" will be used throughout this paper to refer to generic public earnings-based pension systems. When capitalized, it will refer specifically to the U.S. system.

2 The term "annuity" as used in this paper refers to a guaranteed life annuity contract featuring a series of equidistant payments made to an individual as long as she lives, contingent on her having reached an age of eligibility. This usage is very close to that of the term *pension*, meaning a guaranteed income for life. Both an annuity, as we define it, and a pension provide insurance against longevity risk -- the risk of living so long that one exhausts one's saving. Our usage is narrower than that frequently used in the life insurance industry. For example, Pedoe and Jack in *Life Insurance, Annuities and Pensions* (1974) define an annuity as simply a series of equal payments made at equidistant intervals. Similarly, *Canadian Life and Health Insurance Facts* (1995) defines an annuity as a contract that provides income payments at regular (typically monthly) intervals, usually for a specified period *or* for the lifetime of the annuitant." These definitions thus include payments having a defined termination date, like the Chilean phased withdrawals or those made by Registered Retirement Income Funds. However, these would not insure against longevity risk, and would not be annuities under our definition. *The Delaney Report on RRSPs* also points out that "many insurance companies offer savings plans which they *call* annuities. Some are monthly or yearly savings contracts which are sometimes quite complicated, but are not annuities *per se*. An annuity is a contract that provides payments you *receive*. If you have an "annuity" to which you make monthly payments, what you really have is a monthly savings plan."

Report does consider the possibility of adding an additional flat benefit component based on years of employment. However, the connection between earnings and benefits would remain tenuous;

- a mandatory private defined contribution pillar structured around personal saving accounts. This would be very much like the Chilean system; and
- voluntary or occupational savings plans. The Report suggests that it could be useful to give workers a choice between mandatory personal savings plans and occupational plans.

The Report's recommended approach is very close to the Chilean system. Like Robson, the Report stresses the unsustainability and political risks associated with PAYGO public pillars. The Report also stresses the national savings and growth benefits that would stem from the automatic full funding of new benefit accruals embodied in a private defined contribution plan.

2.4 A Continuum of Retirement Income Systems

The Chilean system is essentially a mandatory defined contribution plan with individual portfolio management and voluntary annuitization. Both it and the Robson proposal can be usefully situated on a continuum of systems ranging from the status quo to outright abolition. Such a continuum is displayed in Table 1, where shaded boxes denote functions where either private provision or individual choice predominate.

2.4.1 Public Systems

We first describe a series of essentially public systems. These have the common features that saving and public annuitization are mandatory, and fund portfolios are controlled centrally by one or more managers, not by individuals.

The Public (1) system represents the current approximately PAYGO CPP. The Public (2) option differs only in that it is fully-funded, however fund management continues to be public. The Public (3) system is the same as Public (2) except that the central fund is privately managed according to public guidelines. An example of this could be a splitting of the fund amongst several private portfolio managers operating at arms length from the government.

The Public (4) system represents a more radical change in that it switches the plan from a defined benefit to a defined contribution basis. It remains, nevertheless, very much public. Contributors are required to contribute to dedicated accounts representing shares in the total fund. "Centralized" in this system refers to the fact that the dedicated accounts must be held as shares in the total fund, with the disbursement of the fund among the private managers still ultimately determined by those responsible for overseeing the Plan. Upon reaching retirement age, workers are required to convert their shares of the fund into a publicly-provided annuity.

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Table 1: Earnings-Based Retirement Income System Continuum (shaded boxes denote functions where either private provision or individual choice predominate)

Option	Fund Management	Saving	Funding Degree	Plan Type	Annuitization	Annuity Provision
Public (1)	public	mandatory	small	defined benefit	mandatory	public
Public (2)	public	mandatory	full	defined benefit	mandatory	public
Public (3)	private; centralized	mandatory	full	defined benefit	mandatory	public
Public (4)	private; centralized	mandatory	full	defined contribution	mandatory	public
Quasi-Private-Public (1)	private; decentralized	mandatory	full	defined contribution	mandatory	public
Quasi-Private-Public (2)	private; decentralized	mandatory	full	defined contribution	voluntary	public
Quasi-Private-Public (3)	private; decentralized	mandatory	full	defined contribution	mandatory	private
Privatized (Chilean)	private; decentralized	mandatory	full	defined contribution	voluntary	private
Abolition (Robson)	private; decentralized	voluntary	n/a	n/a	voluntary	private

2.3.2 Quasi-Private-Public Systems

We now describe a series of "quasi-private-public" systems. These have the features that saving is mandatory but fund portfolios are controlled by individuals. Annuitization is mandatory *and/or* public.

The Quasi-Private-Public (1) system differs from the Public (4) system by devolving the portfolio management of the individual accounts to the workers themselves. In this system there ceases to be any central fund. Upon reaching retirement age, however, workers are still required to convert their personal funds into publicly-provided annuities. In the Quasi-Private-Public (2) system, workers reaching retirement age can choose to purchase either a publicly-provided annuity or opt for phased withdrawals. In the Quasi-Private-Public (3) system, workers reaching retirement age must purchase a privately-provided annuity.

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Public (3)	**private; centralized**	mandatory	full	defined benefit	mandatory	public
Public (4)	**private; centralized**	mandatory	full	defined contribution	mandatory	public
Quasi-Private-Public (1)	**private; decentralized**	mandatory	full	defined contribution	mandatory	public
Quasi-Private-Public (2)	**private; decentralized**	mandatory	full	defined contribution	**voluntary**	public
Quasi-Private-Public (3)	**private; decentralized**	mandatory	full	defined contribution	mandatory	private
Privatized (Chilean)	**private; decentralized**	mandatory	full	defined contribution	**voluntary**	**private**
Abolition (Robson)	**private; decentralized**	**voluntary**	n/a	n/a	**voluntary**	**private**

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2.3.3 Private Systems

Finally we turn to the private systems. These have the features that fund portfolios are controlled by individuals and annuitization is both voluntary and private. The savings function can be either mandatory or voluntary.

In the Private (Chilean) option, workers reaching retirement age can choose to purchase either a privately-provided annuity or opt for phased withdrawals. Saving is mandatory. The last (Robson) option represents outright abolition. Retirement saving is tax-sheltered, but voluntary.

The key messages obtained from an examination of this continuum of options are, first, that privatization has no unique definition -- some functions can be private and others public, and second, that many features of a privatized system, such as fuller funding and dedicated accounts, are achievable within a public system. Keeping these points in mind, we now turn to our evaluation of private systems.

3. Private Systems: A Qualitative Assessment

A key question that must be answered before we can assess the qualities of private systems is, in what way does a pension system *per se* differ from other types of personal saving? The answer is that any true pension system, be it public or occupational, mandates both saving and the annuitization of that saving. RRSPs are a part of Canada's retirement saving system, but they are neither mandatory, nor designed to provide efficient annuitization, and do not therefore have the characteristics of a pension.

In the standard life cycle model with uncertain lifetimes and no bequests[3] it will be optimal for individuals to annuitize all of their wealth, provided that an efficient annuities market exists (annuities are available an actuarially fair rate of return). This is because an efficient annuity offers higher lifetime consumption possibilities than other assets. By pooling longevity risks, it allows each individual to insure against the danger that she will live long enough to exhaust her savings. Figure 1 demonstrates this point. In the absence of both social security and annuities, saving a dollar when young translates into 1 + r dollars of future consumption, where r is the rate of interest on regular (non-annuity) assets. If q is the probability that individuals will survive to old age ($0<q<1$), then an efficient annuity will offer a return $\frac{1+r}{q}$, which is higher than 1 + r. It can do this because surviving individuals receive not only the return on their own saving, but also a share of the pooled returns on the savings of those that did not survive[4].

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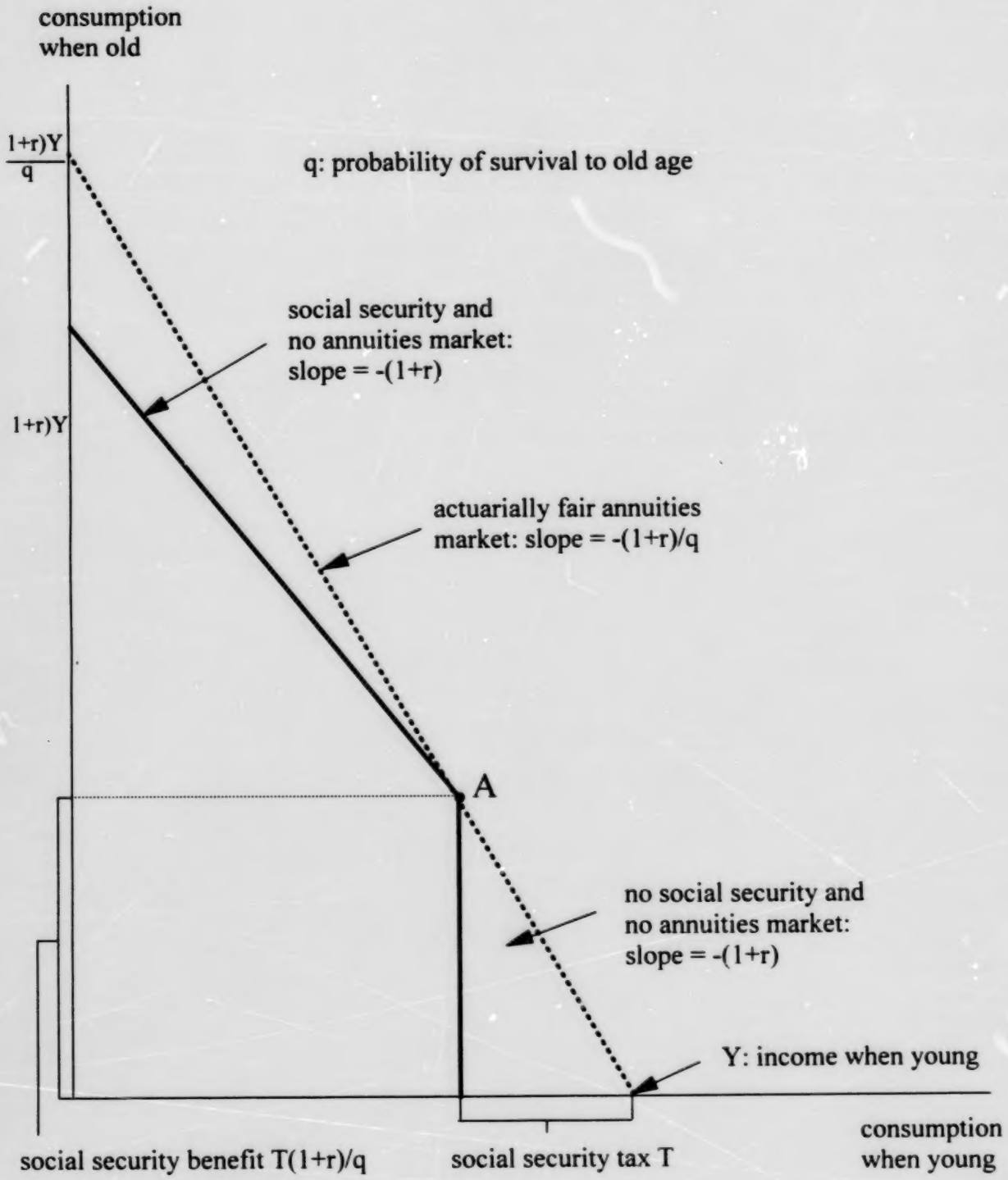
[3] The presence of a bequest motive will imply that some wealth will not be annuitized. However, the basic results still follow.

[4] A formal comparison of annuities and phased withdrawals (such as RRIFs) is provided in Appendix A.

Figure 1: The Impacts of Actuarially Fair Annuities and Social Security on Lifetime Consumption Possibilities


consumption when old
(1+r)Y / q
q: probability of survival to old age
social security and no annuities market: slope = -(1+r)
(1+r)Y
actuarially fair annuities market: slope = -(1+r)/q
A
no social security and no annuities market: slope = -(1+r)
Y: income when young
consumption when young
social security benefit T(1+r)/q
social security tax T

Actuarially fair social security imposes a tax T when young and, like an efficient annuity, translates this into $\frac{T(1+r)}{q}$ dollars when old. For any T, the point A in Figure1 will thus always lie on the dashed efficient annuities market budget constraint line. In the absence of annuities markets any residual saving by individuals can still only be converted at the rate 1 + r. In the presence of efficient annuities, social security is a perfect substitute for private annuity savings and does not therefore raise consumption possibilities. However, private annuities markets tend to be inefficient and/or thin, hence social security can increase lifetime consumption possibilities.

Figure 2 shows how the absence or presence of efficient annuities (or equivalently, actuarially fair social security) affect retirement age consumption when longevity is uncertain and there is no bequest motive[5]. If an efficient annuity is available, agents will fully annuitize their wealth at retirement and use it to maintain a stable consumption path for as long as they live. If neither an annuity nor social security is available, agents must gradually reduce their retirement consumption in order to avoid exhausting their assets before they reach the maximum possible age. If they die before reaching the maximum possible age, some assets will be left as an accidental bequest. The absence of annuities or social security forces agents to have a lower standard of living when retired than when working.

Private annuity market failures stem primarily from an adverse selection problem, which we will now examine.

3.1 The Problem of Adverse Selection

Adverse selection arises in competitive markets when buyers and sellers have differing information regarding the characteristics of the commodities being exchanged. Rothschild and Stiglitz (1976) analyzed competitive insurance markets having this feature and found that equilibria will be inefficient and may not even exist.

Adverse selection affects annuity markets because individuals nearing retirement have greater information regarding their expected longevity than insurers. At an aggregate actuarially-fair annuity price[6] individuals with shorter than average life expectancies will select themselves out of the market and bias the participant pool towards those with longer than average life expectancies.

If insurers did have full information regarding each individual's life expectancy, then an efficient *separating equilibrium*[7] would result. In a separating equilibrium the

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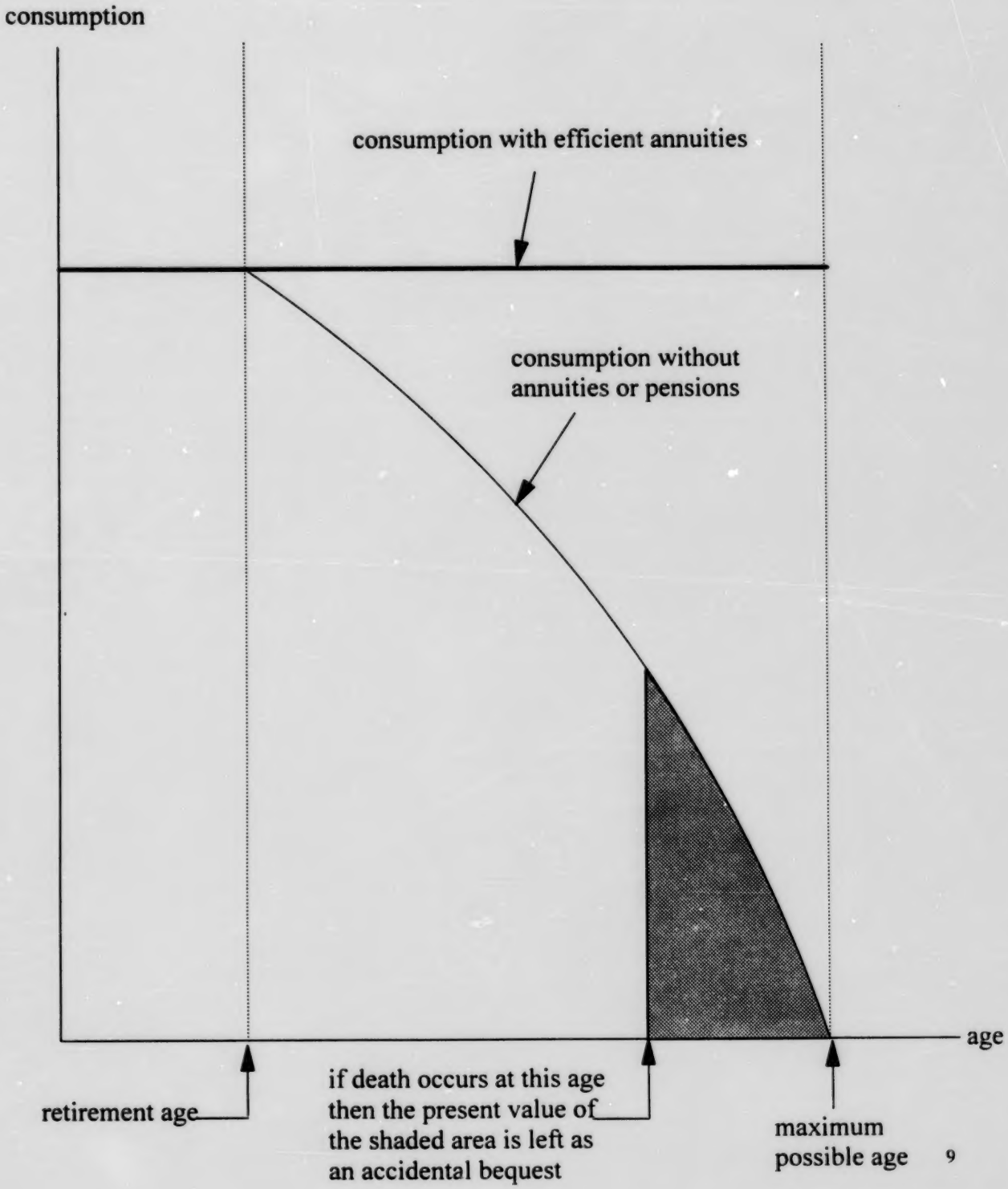
[5] A technical exposition is provided in Boadway and Townley (1988)

[6] Price in this context refers to the amount that one must pay for a life annuity paying 1 dollar each period.

[7] To be an equilibrium contract, a contract must earn zero profits and there must not be any non-equilibrium contract that if offerred, would earn positive profits.

Figure 2: Life Cycle Consumption With and Without Efficient Annuities (No Bequest Motive)


consumption
consumption with efficient annuities
consumption without annuities or pensions
age
retirement age
if death occurs at this age then the present value of the shaded area is left as an accidental bequest
maximum possible age

price and/or quantity characteristics of each annuity contract are related to an individual's risk characteristics. This contrasts with a *pooling equilibrium* in which all individuals are offered annuity contracts with identical price-quantity characteristics.

Figure 3 demonstrates the full information case. For simplicity, it is assumed that there are two types of agents: those with "short", and "long" life expectancies. These agents have identical labour income when young and differ only in their life expectancies. No one knows exactly when he will die, but each individual knows his own life expectancy, that is, the probability that he will survive to old age. Insurers know only the aggregate survival probability and cannot distinguish between identically-aged individuals of different life expectancy. Denoting the two types of agents as "a" and "b" with survival probabilities q^a and q^b, $(q^b > q^a)$, then under full information each agent will fully annuitize at the actuarially fair prices $p^a = \frac{q^a}{1+r}$ and $p^b = \frac{q^b}{1+r}$ respectively. The separating equilibrium will be given by the points A and B representing the tangencies of each agent's indifference curve[8] to her respective budget constraint.

Figure 4 displays the competitive market equilibrium that results under private information in a world where insurers cannot monitor the total annuity quantities that agents purchase. This could occur if agents can divide their annuity purchases among many insurers and insurers do not share annuity purchase information with each other[9]. In this case an inefficient pooling equilibrium will result. If insurers offer annuities at the aggregate actuarially fair price, P^f, then type-a agents will purchase fewer annuities than type-b agents. This will bias annuity purchases towards agents with above average life expectancies, hence firms will suffer losses and the price cannot be an equilibrium. The equilibrium zero profit price will be at P*, which is higher than the aggregate actuarially fair price.

The analysis of the competitive equilibrium under adverse selection becomes more complex if firms are able to monitor the quantities that individuals purchase. If monitoring is possible, firms will compete in the design of both price and quantity components of contracts. Rothschild and Stiglitz's analysis assumes that firms can perform this monitoring. This means that either agents can purchase at most one

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[8] The indifference curves follow from the lifetime utility functions:

$$V^a = U(c_1^a) + q^a U(c_2^a)$$
$$V^b = U(c_1^b) + q^b U(c_2^b)$$

where U is concave.

[9] The absence of quantity monitoring means that firms can specify a price component, but not a quantity component of annuity contracts. In a separating equilibrium the price characteristics of each annuity contract are related to an individual's risk characteristics, while in a pooling equilibrium all individuals are offered annuity contracts with identical prices.

Figure 3: Competitive Annuities Market Equilibrium
Under Full Longevity Risk Information

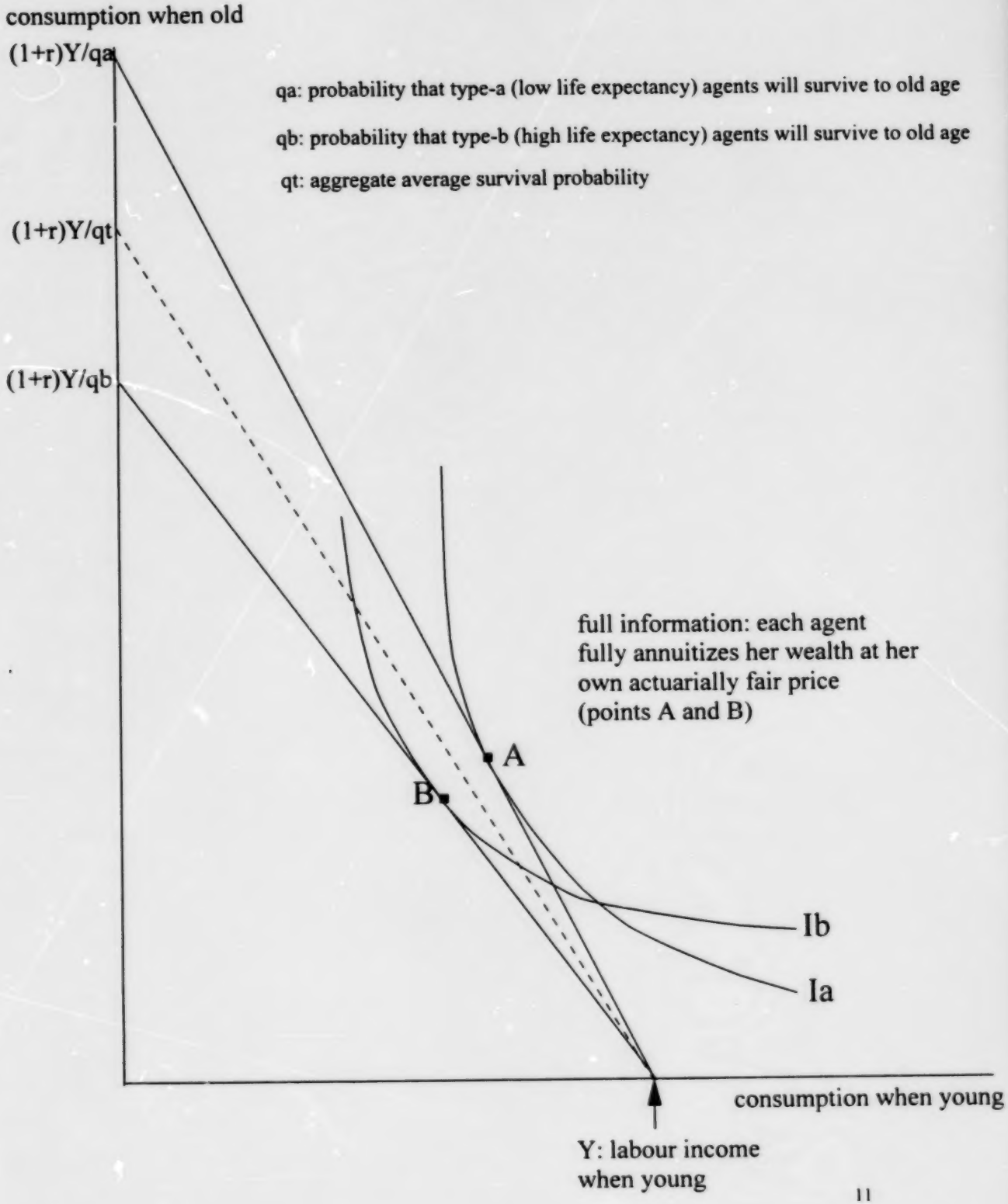
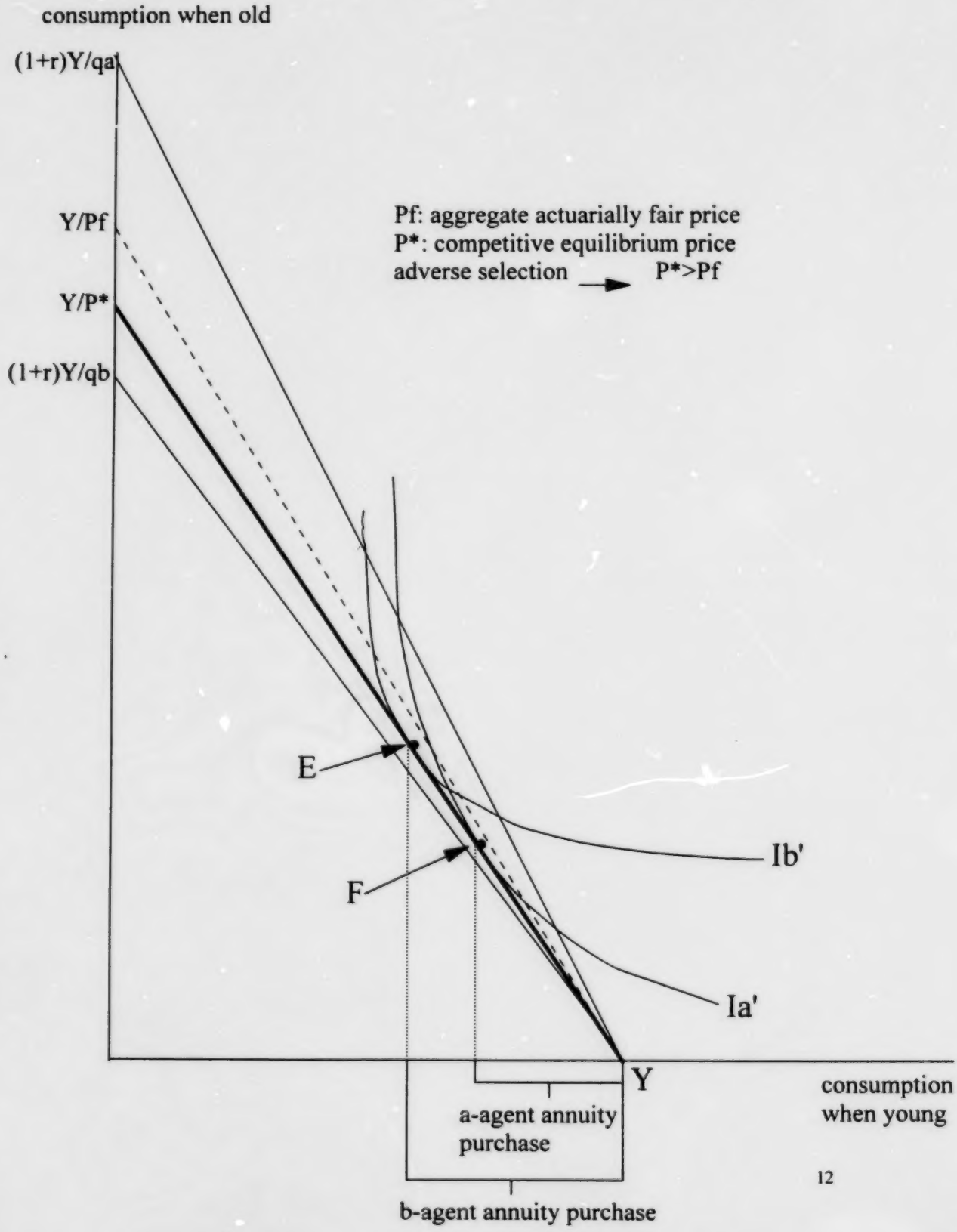


Figure 4: Competitive Annuities Market Equilibrium Under Private Information: No Quantity Monitoring (Price Competition Only)



insurance contract, or that companies share information about agents' purchases. An example is the provision in some insurance contracts that a policy is void if any prior contract exists. It is not clear whether this type of provision is likely to be applicable to annuity contracts, although the possibility of information sharing remains.

Eckstein *et al* (1985) use the Rothschild-Stiglitz framework to analyze competitive equilibria in annuities markets with quantity monitoring and imperfect information. As in our analysis of the no-monitoring case above, they assume that there are two types of agents with differing life expectancies. They demonstrate that if firms take other firms' actions as given, then no pooling equilibrium will exist. This is because for any potential pooling equilibrium contract it is always possible to offer an alternative contract featuring lower price *and* quantity components that would be attractive to low-life expectancy agents but not to high life-expectancy agents. By definition, the pooling equilibrium candidate must have earned zero profits, so the alternative contract must earn positive profits given that it screens out the high risk long-life expectancy agents. However, this means that the pooling equilibrium candidate violates the second condition of an equilibrium (see footnote 7). Ultimately, there may be no equilibrium, or an inefficient separating equilibrium may result. In the latter case, the negative externality created by the long-life expectancy agents will be completely dissipated; it will make the short-life expectancy agents worse off without making the long life expectancy agents better off.

Boadway and Townley (1988) introduce term annuities into the analysis and assume that each individual has a continuous probability distribution of survival over the years of his or her retirement. The resulting equilibria are altered somewhat, but remain inefficient.

The relevance of the annuities market failure literature for the analysis of social security is discussed in section 4.8.

Figure 5 shows the survival probabilities to a given age for general population and annuity-purchasing U.S. males at age 65 in 1970[10]. The adverse selection problem is clearly present, with significantly higher survival probabilities for annuity purchasers. Friedman and Warshawsky (1990) conduct model-based empirical tests and conclude that the small demand for market annuities by early retirees in the United States is almost entirely due to their actuarially unfair character (primarily resulting from adverse selection), with the existence of a bequest motive playing a relatively minor role. Both play a role in the low demands of later retirees. Power and Townley (1993) argue that social security itself can crowd out expenditures on annuities. However, Kotlikoff (1987) argues that the thinness of annuities markets is not a result of the existence of social security and occupational pension plans because we do not observe substantial residual annuity demands (demands on the part of some agents in excess of their pension wealth)

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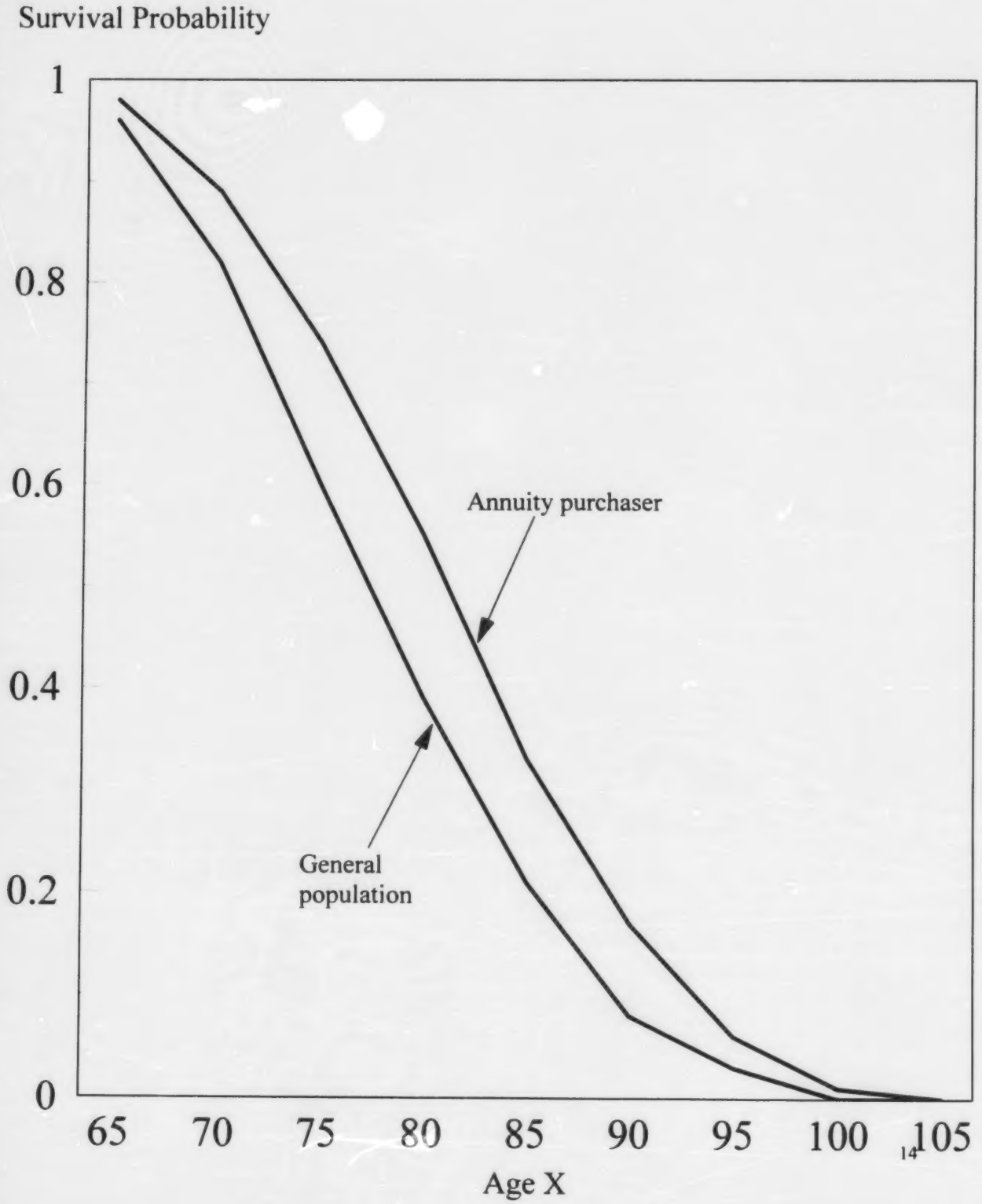
[10] Source: Friedman and Warshawsky (1990)

Figure 5: Probability of Survival to Age X
for U.S. Males at Age 65 in 1970



and because annuities markets were thin even before the introduction of social security systems. This is consistent with Warshawsky's (1988) finding that the introduction of Social Security did not increase the adverse selection component of annuity load factors[11] (see Figure 6). Abel (1986) had argued, like Power and Townley (1993), that the introduction of Social Security led to reduced demand for annuities. This demand reduction would, in theory, have been greatest for individuals with shorter life expectancies, thereby worsening the adverse selection problem. Warshawsky argues that the load factor evidence can be explained by the fact that, even prior to Social Security, most elderly individuals did not hold private annuities.

A Chilean-type privatized system in which individuals can choose to convert their funds to an annuities upon retirement suffers from the adverse selection problem. Unlike public and occupational pension plans, it cannot efficiently pool longevity risk. In practice, inefficient pricing has meant that few Chileans have opted for annuity purchases. Most have opted for phased withdrawals. However, these do not insure against longevity risk.

A self-directed plan could avoid the adverse selection problem by forcing all participants to annuitize their accumulated funds at retirement and by prohibiting conversion of non-fund assets into annuities. Mandatory annuitization alone would not suffice, because agents with long life expectancies would still wish to purchase additional annuities. This adverse selection would reintroduce the actuarial bias, leading to negative profits.

Privatization options that mandate contributions but allow for voluntary annuitization may actually be worse in a welfare sense than outright abolition of the CPP. This is because the funds in such a system could not be annuitized at an efficient rate owing to the adverse selection problem. Under outright abolition, employees and employers could at least negotiate more substantial mandatory occupational plans as a substitute for the loss of the public plan. This would at least allow many individuals to get close to their desired level of efficient annuitization. Under a mandatory privatized CPP, accumulated funds could not be efficiently annuitized.

The failure of private markets to provide efficient longevity insurance is not mentioned by Robson, and is discussed only in passing in the main body of the World Bank Report. In the chapter discussing personal savings plans, the Report briefly notes that "in mandatory saving schemes, workers assume the investment, longevity, and inflation risks of their retirement funds. Retirement income will be lower if investment performance is poor. And if people live longer than expected, they may outlast their

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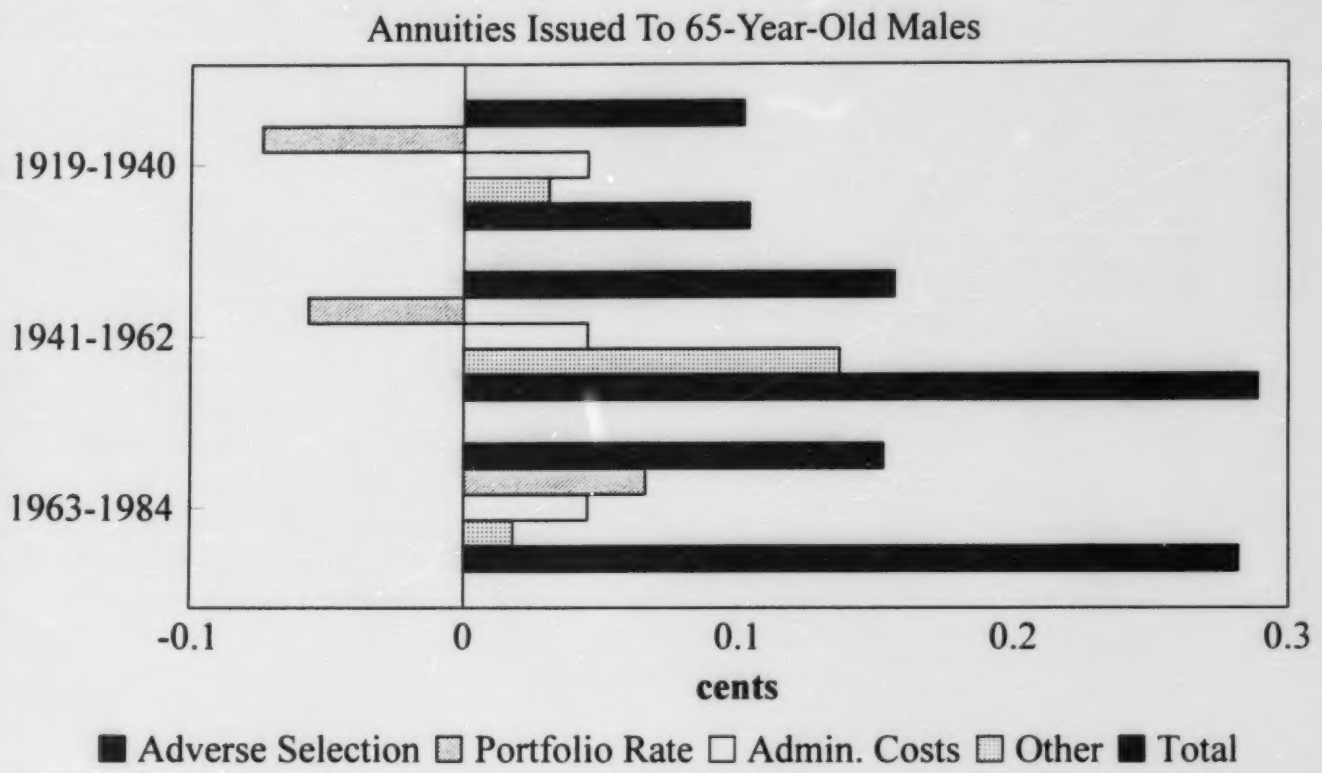
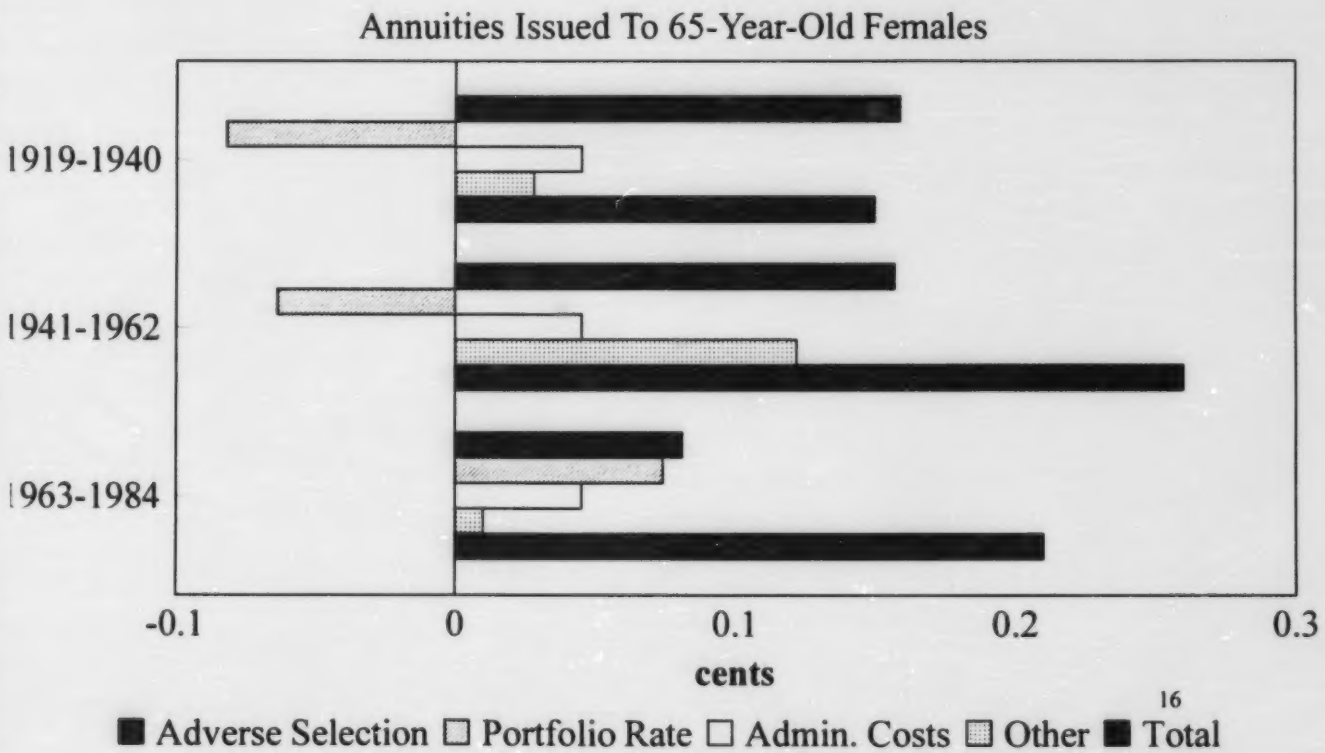
[11] The load factor is the net cost of purchasing an annuity with an actuarial present value of 1 dollar. For example, if one must pay $1.30 for an annuity with an actuarial present value of 1 dollar, then the load factor is $0.30. The load factor thus measures the actuarially unfair component of the annuity price. The load factor stems from adverse selection, investment by insurance companies in portfolios with returns that differ from those available on government bonds (the "portfolio rate component" in Figure 3), administrative costs and other factors such as taxes and unexplained components.

Figure 6: Sources of Load Factors on U.S. Life Annuities





retirement savings." The chapter concludes, however, by declaring that "[decentralized] mandatory saving plans can provide an adequate *pension*[12] for middle- and high-income workers, but they fail to protect workers with low wages as they grow old or to insure against sharp dips in investment performance." This, however, contradicts the earlier statement, because a pension is an annuity that insures against longevity risk. The Report admits that the system it describes fails to do this, hence it cannot provide a pension in the true sense of the term.

The Report does discuss annuity market failures in greater detail in an appendix titled "Annuity Market Problems and How to Resolve Them." Here the Report acknowledges that private annuity markets face a number of serious problems. In addition to adverse selection and the use of quantity restrictions ("creaming" of the best risks by insurance companies), the Report notes that setting a deadline for an annuity purchase creates the risk that the market value of assets may be abnormally low on that date. The alternative, a variable annuity whose payment fluctuates as market conditions change, forces the retiree to bear a fluctuating pension for the rest of her life. The Report admits that allowing people to choose annuitization or phased withdrawals (as in the Chilean system) causes the adverse selection problem to immediately reappear. The Report also notes that, because annuity purchases are lumpy and irreversible, high commissions are often paid to salespersons who complete a deal. The Report argues that:

> Clearly, private annuities markets must be heavily regulated, particularly if annuities become mandatory. At the very least, permissible risk categories must be defined, pools for bad risks created, survivors' benefits required, standard contract forms used, consumer information provided by some impartial organization, variable annuities offered, and a reserve fund created or reinsurance purchased by insurance companies to ensure that they will be able to meet their obligations.

This leads the Report to conclude that "the complexity of these problems probably limits the degree to which annuities should be mandatory." This is a critical admission, because if annuitization is voluntary, private annuities markets will suffer from adverse selection, and the key characteristic of a pension -- the efficient provision of longevity insurance -- will be absent. If a privatized system cannot provide such insurance it will likely be inferior to public systems.

3.2 The Problem of Moral Hazard

Kotlikoff (1987) points out that private annuities markets may also fail because of the free-rider problem that arises because agents know that if they exhaust their savings when old, the government will support them in any case. If some saving is not mandated, agents may save less than adequately for their retirement. This problem seriously calls

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[12] My italics.

into question the Robson view that CPP should be abolished while maintaining OAS/GIS. Both the CPP and mandatory Chilean-type systems help overcome the moral hazard problem by forcing agents to save on their own behalf.

3.3 Administrative Costs

A serious problem facing a decentralized private system is that it is likely to be more administratively costly than a public system. In his analysis of the Chilean privatized system, Diamond (1993) points out that it suffers from significantly higher administrative costs than in a public system, estimated to be 3 per cent of average taxable earnings. Diamond attributes these costs to a number of factors. Among the most serious is that a private system cannot take advantage of the economies of scale available to a national public plan. Costs are increased by competitive attempts by portfolio managers to attract more customers through advertising, sales personnel, etc. Another problem is that in actual markets demand is much less sensitive to price than in idealized competitive markets. This is exacerbated by the fact that the savings component of the system is mandatory. Firms will have market power, leading to price markups and the earning of rents. Higher costs also arise because the collection of contributions and the delivery of benefits represents the kind of well-defined task that lends itself to more efficient public supply, and individual choice with many small accounts is costlier than group choice. Diamond notes that the existence of inefficiencies and market power has forced the state to heavily regulate the private market.

Evidence regarding the relative costs of Canadian public and private systems is provided in our analysis of the case for a public system (Section 4.8.3).

4. Public Systems: A Qualitative Assessment

In this section we will first assess the criticisms of public systems made by proponents of privatization and then review the case in favour of a public system. As mentioned previously, criticisms of public systems can be placed in five basic categories: lack of sustainability, susceptibility to political interference, lack of security of future benefits (which is related to lack of sustainability), economic distortions, and the preference of private over government choice.

4.1 Criticisms of a Public System

Robson argues that the present public system is not economically sustainable because it is a "Ponzi game." He argues that it is not politically sustainable because future generations will not accept paying higher than full cost contribution rates that they did not vote for. These are two different arguments which we will now examine.

4.1.1 Lack of Economic Sustainability

The CPP runs a Ponzi game if the growth rate of the unfunded liability permanently equals or exceeds the implicit interest rate on that unfunded liability. If the

unfunded liability growth rate is permanently less than the income base growth rate, then the Ponzi game is sustainable. This can only occur if the growth rate of the income base exceeds the interest rate. If the unfunded liability growth rate permanently equals or exceeds the income base growth rate, then the Ponzi game is unsustainable, because implicit interest payments on the unfunded liability will eventually exceed the income base, forcing default. In a world where real interest rates permanently exceed the growth rate of the real income base, a Ponzi game is by definition unsustainable.

The CPP, however, cannot be a Ponzi game as defined above except in the case of an endless succession of benefit enrichments (over and above indexation of a new retirees' starting pension to the average industrial wage). This is because, in a mature PAYGO system with a constant replacement rate, the growth rate of the unfunded liability is guaranteed to equal the growth rate of the income base. It is true that for many years following the introduction of a PAYGO system the unfunded liability will grow faster than the income base, however, this does not mean that a Ponzi game is being run, because a Ponzi game requires that such a differential be permanent. As James *et al* point out, a PAYGO system is economically flawed because the unfunded liability it generates reduces national saving, however this does not mean that it is an economically unsustainable Ponzi game.

Robson argues that the palatability of the CPP to future generations could only be maintained by ongoing benefit enrichments. This would be a Ponzi game if benefit growth was large enough to generate unfunded liability growth permanently in excess of the real interest rate. The assertion regarding the palatability of the CPP falls under the domain of political sustainability, to which we now turn.

4.1.2 Lack of Political Sustainability

Robson argues that, without ongoing benefit enrichments, future generations would receive less than they paid in benefits, hence it would be in their interest to terminate the system. It is true that if the CPP matures in its current approximately PAYGO form, future generations will be forced to permanently pay higher-than-full cost contribution rates. This is doubtless unfair, and as James *et al* point out, economically costly. However, it does not necessarily follow that it would be in the interest of future generations to phase out the plan (in the future), because neither privatization nor abolition solve the problem of the unfunded liability that lies at the heart of the transfer from young to old and from future to current generations[13]. Any privatization option (including Robson's) would involve a gradual phase-out of the existing CPP that would still guarantee current recipients as well as older workers nearing retirement their full benefits. Younger workers would still have to pay a tax to pay off the unfunded liability, and would receive no corresponding future benefits. If a general tax applied to both the young and old it would be more generationally equitable than the portion of the CPP

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[13] This point is also made by Mitchell and Zeldes (1996) and Gramlich (1996)

payroll tax that exceeds the full cost rate. However, this would only partly mitigate the intergenerational transfers, and does not in any case require privatization. The CPP unfunded liability could be transformed into explicit holdings of government bonds in the CPP fund, thereby fully-funding the public system, with the new debt gradually paid off by means of a more general and equitable tax.

The only the way the current generation of younger workers can avoid paying more than they will receive is by defaulting on their obligations to current and near-retirees. However, reneging on benefits to current or near-retirees is generally not seen as a viable option because it does not allow these individuals enough time to alter their saving patterns while working in response to the unexpected change in the rules of the game. Once reneging is ruled out, the working age cohort will have to pay for much of the unfunded liability, either through a contribution rate increase or a general tax.

The net saving to younger workers would also likely be much less than the reduction in CPP contributions achievable by reneging. This is because these workers would likely suffer a reduction in bequests from their unexpectedly poorer parents, as well as an increase in general taxation required to finance the increased OAS/GIS payments to lower income CPP recipients.

Intergenerational altruism also works in two directions: parents care about their children and children care about their parents. The latter is called *filialism* and is discussed in detail by Blinder (1988). Reneging on promised benefits to the elderly would not necessarily be welfare-enhancing for their children, even if it did allow CPP contribution rates to be lowered. These factors could mitigate significantly the "poisonous politics" of the CPP. The Robson framework is one where the young and old are in separate camps with opposing interests. A framework in which the young and old are children and parents in common households (defined in the broad dynastic sense of Blanchard) could reduce the force of Robson's conclusions regarding the unacceptability of the CPP to future generations.

Maintaining PAYGO will exacerbate the intergenerational transfer problem. This, however, simply justifies fuller funding as soon as possible, not the abolition of the CPP.

4.1.3 Political Interference

Proponents of privatization argue that public pension systems are susceptible to two types of political interference: first, an arbitrary enrichment of benefits with the full cost in terms of contributions borne by later generations, and second, the subjection of fund management to political rather than market forces.

A public defined benefit PAYGO system may well be subject to the risk of benefit enrichment because it represents a pure intergenerational transfer from future to current generations, and only current generations vote today. There are a number of ways, however, whereby this danger could be reduced. The first would be to gradually

move away from PAYGO, and, once fuller funding had been achieved, require in law that only small deviations from the desired degree of funding would in future be tolerated. Any unfunded liability that developed as a result of a benefit enrichment would have to be amortized within a fairly short period, requiring the contribution rate to be held temporarily well above the full cost rate. This would ensure that the current working generation would have to pay for an increase in current benefits. It would not, of course, prevent a transfer from current workers to the current retired, but it would make it politically unpalatable, which is the objective.

The risk of benefit enrichment may also be less than it was during the 1960s and 1970s when real growth rates exceeded real interest rates. In such a context, running a Ponzi game would have seemed sustainable and could help explain why some past benefit enrichments occurred. Today, governments know that this is no longer so, both with respect to the CPP and the general government budget balance. There is a greater understanding that higher debt today implies either higher taxes or lower spending tomorrow. In today's context, there is no free lunch.

The fund management political interference problem could be dealt with by devising institutional structures that would guarantee arm's length fund management.

4.1.4 Security of Benefits

Proponents of a privatized system like that of Chile argue that its use of dedicated accounts would give Plan participants a greater sense of security regarding their future benefits because individuals would own the funds in their accounts in a way that is not possible in a defined benefit plan. As we have seen from our examination of the reform option continuum, this is not really an argument for privatization, but rather for switching from a defined benefit to a defined contribution plan. A defined contribution plan could as easily be public, as be private. As Diamond notes: "In Chile, privatization of fund management has been combined with individual choice of fund. This is not a necessary combination. One could have a system where individual accounts are kept by the government, with shares earning their return from their proportion of a single fund that was privately invested ... This combination would have lower costs."

Boskin, Kotlikoff and Shoven (1988) have advocated converting the U.S. Social Security system into a public defined contribution system. This would be achieved by mandating contributions into personal security accounts (PSAs). In this system, each individual's social security contributions would be allocated by the government toward the purchase of a retirement annuity, a disability annuity, an old age spousal survivor annuity and a child survivor annuity. These annuities would be held in each individual's PSA account, and these accounts would be fully portable. All PSA participants would receive identical rates of return.

The PSA proposal's emphasis on personal accounts that individuals own seems at first glance similar to privatization proposals based on the Chilean system. However, this common feature has nothing to do with the private aspect of the Chilean system

(individual portfolio choice and voluntary annuitization), but rather with the defined contribution feature of that system. Boskin, Kotlikoff and Shoven are quite explicit: "In our PSA proposal, we recognize the need for mandatory public provision of social insurance. Private insurance markets are hampered by severe problems of adverse selection, making their pricing far from actuarially fair, and they fail to provide inflation-protected life annuities."

Defined benefit and defined contribution systems both have differing strengths and weaknesses. Bodie, Marcus and Merton (1988) argue that the key advantage of defined benefit systems is that they provide greater replacement rate security, while the key advantage of defined contribution systems is greater transparency of the true value of the pension assets accrued in each year. While a defined contribution system enables individuals to determine how much is in their personal accounts, this does not provide transparency regarding their replacement rate in 30 years time. A defined benefit system could be made more transparent by providing participants with annual statements listing their current and past contributions and the resulting accrual of future benefits.

Public perceptions regarding the security of future benefits could also be enhanced by more fully funding the existing public defined benefit systems. Fully-funded defined benefit occupational pension plans are generally seen as sound guarantors of future benefits, even though participants do not have ownership claims on individual accounts.

4.1.5 Economic Distortions

It is often argued that privatization would raise national saving and reduce labour market distortions. These claims are frequently based on comparisons of public PAYGO systems with private systems. As such, they are really comparisons of unfunded and funded systems, not public and private systems. For example, Feldstein (1996) considers a "privatization" of social security consisting of an initial substitution of existing unfunded liabilities by explicit government debt, followed by a gradual transition to a privatized funded system. He finds that saving, the capital stock and social welfare would be raised by such a move. Feldstein's definition of "privatization," however, differs little from our "Public CPP (4)"option in Table 1:

> In the future, employees (or their employers) are required to contribute to a funded program. Although this could be a fund managed by the government itself, the countries that consider funded programs have proposed that the funds be invested privately, subject only to government regulation and supervision. This paper will therefore refer to the shift from an unfunded pay-as-you-go program to a funded program as "privatizing" social security.

Feldstein's economic benefits thus have nothing to do with privatization *per se*. They are fully consistent with the results obtained by James *et al* that fuller funding would raise domestic saving and investment, leading to an increased capital stock and reduced net foreign indebtedness. Moving from PAYGO towards fuller funding,

however, can easily be achieved within a public system -- privatization is not required. Approximate PAYGO is a feature of the original CPP, but it is not an inherent feature.

Kotlikoff (1995; 1996) uses the Auerbach-Kotlikoff dynamic life-cycle model to simulate the economic effects of abolishing the U.S. PAYGO social security system. He first assumes that workers regard 100 per cent of their Social Security payroll taxes as a marginal tax on their labour supply. He justifies this perceived zero linkage of contributions and benefits on the grounds that the linkage is complex and difficult for workers to understand (although workers are assumed to know the true structure of the economy and have model-consistent expectations regarding all economic variables). Under this assumption he finds that abolition would raise social welfare by 4.5 per cent. He then considers an alternative full linkage case in which workers regard none of their Social Security payroll taxes as a marginal tax on their labour supply. Under this assumption he finds that abolition would lower social welfare by 3.1 per cent. He concludes that "there is no guarantee that privatizing social security will improve economic efficiency."

As with Feldstein's analysis, Kotlikoff's comparison of a PAYGO public system with a private system makes the case for the latter seem stronger. His zero linkage assumption reinforces this. However, neither full nor zero linkage reflects the actual contribution-benefit linkage in a system like the CPP. The average effective CPP marginal tax rate equals neither the contribution rate nor zero, but rather the difference between the contribution rate and the full cost (actuarially-fair) contribution rate. Figure 7 provides a stylized illustration of how these rates are evolving in the CPP. PAYGO rates are presently below their full cost levels, hence the average effective marginal tax is negative. The large unfunded liability means that PAYGO rates will eventually have to rise above the full cost levels, implying permanently positive effective marginal tax rates. A transition to full funding would require an earlier but temporary raising of contribution rates above the full cost levels. Average marginal tax rates would rise above the PAYGO values initially, and would fall to zero[14] once full funding had been achieved at time T.

Figure 8 shows how these rates would evolve if the CPP were gradually phased out by time T. It is assumed that benefits promised to current and near-retirees are paid, but that no new pension rights accrue after a certain point. The full cost rate gradually declines, reaching zero at time T. The need to pay down the unfunded liability still

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[14] While the average marginal tax rate would be zero, many younger workers would face positive marginal rates, while older workers would face negative marginal rates. This is because the existing benefit accrual formula bases benefits on the average of the top 85 per cent of ratios of actual to maximum contributable earnings. If we abstract from the 15 per cent drop-out provision, the averaging feature means that an extra dollar earned when young has a smaller impact on the present value of future benefits than an extra dollar earned when old. Younger workers will thus face above average marginal tax rates while older workers will face below average rates. Workers in a drop-out year will face a marginal rate equal to the contribution rate since that year's contributions will generate no future benefits. While a defined contribution system would make all marginal rates zero, zero *ex ante* marginal rates could be achieved in a defined benefit system by eliminating drop-out provisions and setting the proportion of the maximum benefit equal to the ratio of the present value of past contributions to the present value of past maximum contributions.

Figure 7: Effective Marginal Tax Rates Under PAYGO and Transition to Full-Funding

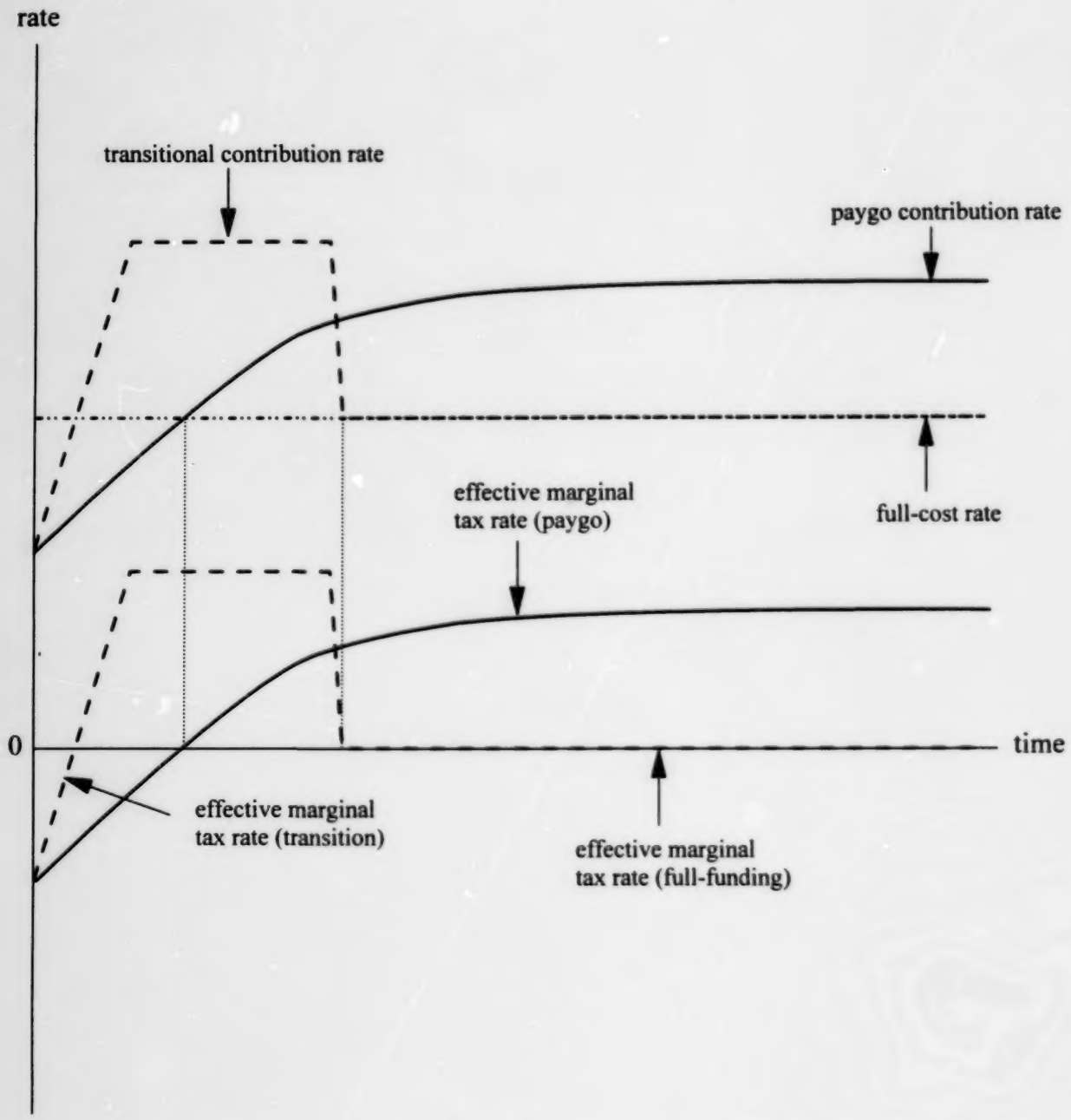
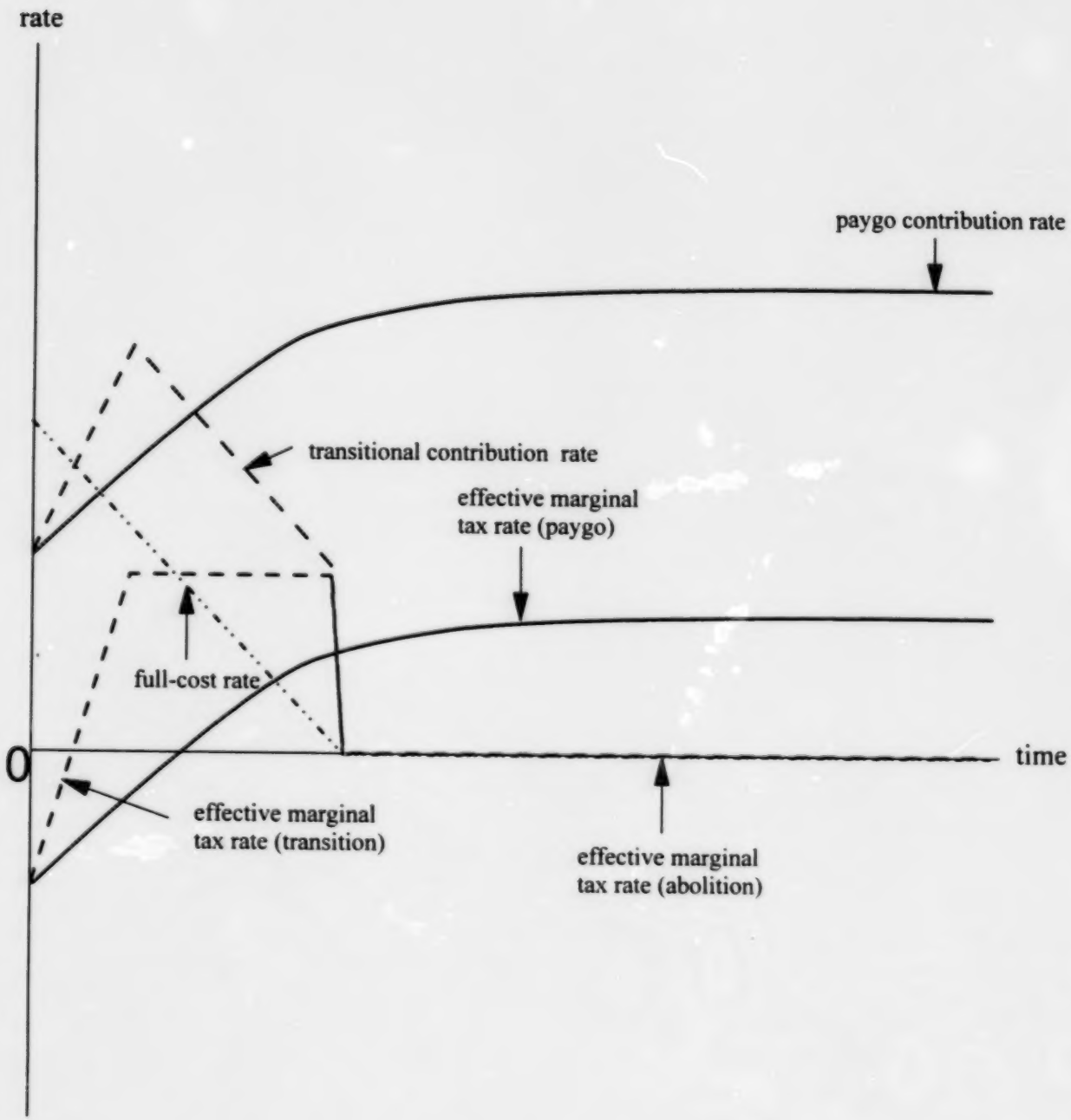


Figure 8: Effective Marginal Tax Rates
Under PAYGO and Gradual Phase-Out



requires that contribution rates be held above the full cost levels during the transition. Since the initial size and pay down rate of the unfunded liability are the same in the full funding and phase-out scenarios, the effective marginal tax rate paths are also identical. Figure 9 shows the initial marginal tax rate increase and subsequent decrease that apply in both cases.

Kotlikoff's assumption of zero linkage implies a massive reduction in effective marginal tax rates equal to the full amount of the contribution rate. In fact, a transition to full-funding (either of a public or a private system) would imply higher marginal taxes initially, and lower marginal taxes later. The average effective marginal tax rate would be zero in a fully-funded steady state, under both private and public systems.

While average marginal tax rates would be zero under full-funding, maintaining the present benefit accrual formula would yield positive marginal tax rates for young workers and negative rates for older workers. Presently, the proportion of the maximum benefit payable to an individual who retires at the normal age of entitlement equals her average lifetime ratio of contributable earnings to maximum contributable earnings[15]. If, as we would expect, the real interest rate exceeds the growth rate of the real wage bill, then contributions early in one's life will have a smaller impact on the present value of future benefits than contributions made later. While a defined contribution system would automatically generate zero marginal tax rates for all age groups, a defined benefit system can also generate zero *ex ante* marginal rates by using an accrual system based on ratios of present values of contributable earnings to maximum contributable earnings[16].

Some have advocated immediate termination of the CPP with obligations to current and near retirees being met by issuing them with government recognition bonds equal to the present value of their originally promised benefits. This amounts to substituting the CPP unfunded liability with explicit government debt[17]. If this extra government debt were paid down through a special payroll tax at the same rate as in the previous cases, then its path would be identical to the effective marginal tax rate shown in Figures 7 and 8. However, if this new debt were not paid down, a new general tax would ultimately have to be imposed to pay the interest on the new debt. This tax would be only slightly lower than the effective marginal tax under PAYGO because no new unfunded liabilities would have accrued after abolition.

Political risks can thus as easily endanger the economic benefits of privatization as of increased funding of a public system. In the case of full funding there is always the danger that the fund will be drawn down through arbitrary benefit enrichments or

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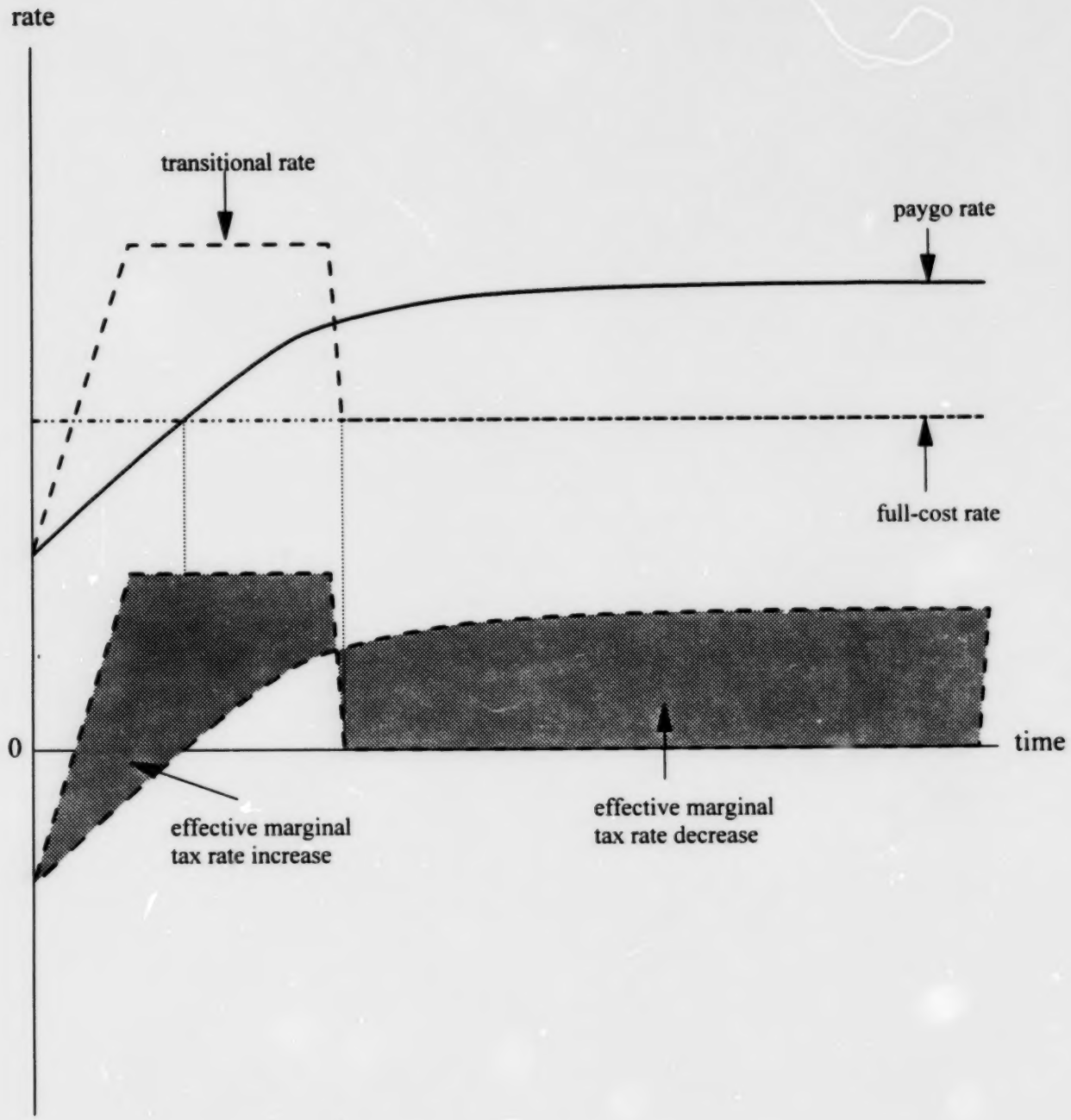
[15] The average excludes the lowest 15 per cent of ratios.

[16] See Appendix B for details.

[17] The same thing could be achieved in a gradual phase-out scenario by intially fully funding the CPP through new explicit debt issuance, then setting contribution rates at the full cost track shown in Figure 4.

Figure 9: Actual Effective Marginal Tax Rate
Change From Transition to Full Funding or Gradual Phase-Out



contribution rate cuts. In the case of privatization there is always the danger that the extra explicit debt used either to provide recognition bonds or fully fund the system during its gradual phase-out will not be paid down. Diamond (1996) also stresses that political risks would remain even under full privatization. He notes that there could be calls for earlier access to the funds in individual accounts for other purposes, such as education and house purchase, and that a fiscally strapped government might make access to other programs conditional on first using the funds in a retirement account.

4.1.6 Individual Versus Government Choice

An implicit justification for privatization is the idea that individual choice is superior to public choice. This could be motivated by the notion that individuals can always do better on their own behalf than can the government. This claim will be assessed in the next section. However, it is worth noting how restricted the choice domain often remains in privatized systems. The Chilean system, for example, continues to mandate saving, and while individuals can choose the portfolio mix of their individual accounts, they must opt for an annuity purchase or phased withdrawals upon retirement.

4.2 The Case for a Public System

We will now review the case in favour of a public CPP. This will not include a defence of its original PAYGO feature, which is not intrinsic to a public system, but rather will consist of the case for a public system *per se*. By a public system, we do not mean the tax-financed flat benefit OAS or the means-tested GIS, but rather a publicly administered contributory system that links benefits to contributions and pays all benefits as publicly-provided annuities. Such a system could be PAYGO or fully-funded, and could be either of the defined benefit or defined contribution type. It could also allow for disbursement of a central fund among a number of private managers operating at arms length from the government.

Arguments in favour of a public system are generally based on paternalistic considerations, the ability to overcome market failures, lower administrative costs and complementarity with occupational plans.

4.2.1 Paternalism

One justification for government-mandated saving is a paternalistic notion that, left to their own, many households would not save enough for their retirement. Kotlikoff notes that inadequate saving and insurance can arise from irrational behaviour such as myopia, misinformation and miscalculation, and because people may willingly accept mandated saving because they fear lack of self-control in their consumption behaviour. Blinder (1988) places particular stress on the latter as an explanation for and a justification of social security. He argues that this is a rational basis for paternalism that may be more stronger than arguments based on irrationalism:

> ... people sometimes find it useful to precommit themselves to rules of behaviour because they fear they will lack the necessary self-control when the time comes. This need not be considered irrational. ... It is a way for rational adults, making their own decisions, to assure themselves that they will not give in to temptation and do something they will subsequently regret.

It is notable that many privatization options, including the Chilean system and that proposed by the World Bank Policy Research Report, implicitly give credence to a paternalistic rationale of the self-control type by continuing to mandate retirement saving. These options extend individual choice to the portfolio decision, but not to the saving decision.

4.2.2 Overcoming Market Failures

A key justification for a public system is that it overcomes the market failures outlined in our assessment of private systems. These are the failure of efficient private annuities markets to exist because of the problem of adverse selection, the failure of efficient private disability insurance to exist because of moral hazard problems, and the effect of moral hazard on private saving.

The adverse selection problem arises because of an information failure, and as Barr (1992) has argued in the more general context of the welfare state as a whole:

> Information failures provide both a theoretical *justification of* and an *explanation for* a welfare state which is much more than a safety net. Such a welfare state is justified not simply by redistributive aims one may (or may not) have, but because it does things which private markets for technical reasons would either do inefficiently or would not do at all.

Individual choice in a context of information failures is not beneficial, but rather lies at the heart of the resulting market failure. As Barr argues:

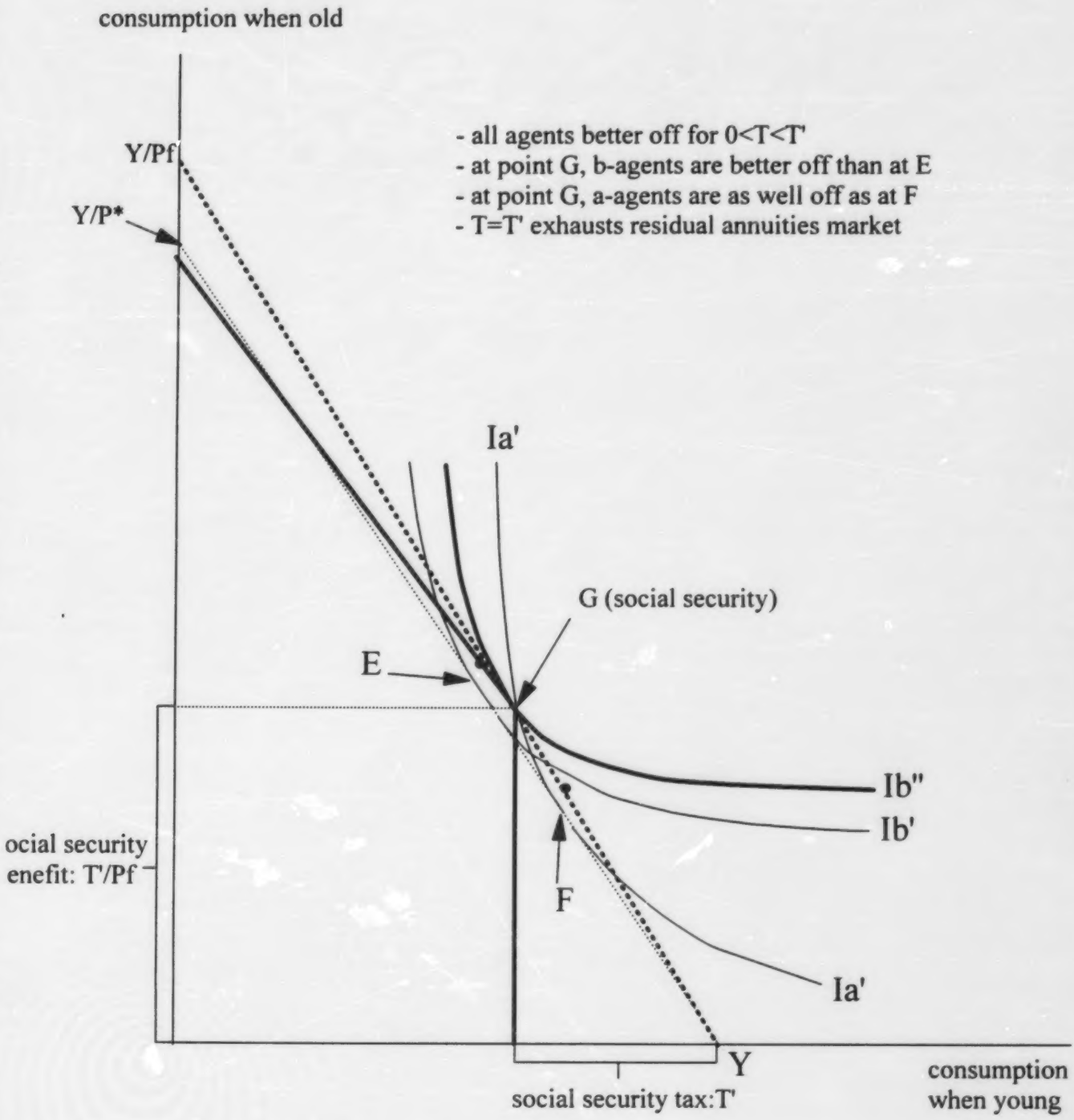
> A key aspect of social insurance is that membership is compulsory. ... because low risks cannot opt out, [compulsion] makes possible a pooling solution, thus avoiding the worst of the problems caused by adverse selection.

As Kotlikoff argues in the context of annuities:

> In contrast to the private market, the government is in a unique position to overcome adverse selection in its provision of annuity insurance by requiring universal coverage. The government also has the unique position of providing real annuities.

Figure 10 shows the impact of mandatory social security when the inefficient adverse selection-induced pooling equilibrium described in section 3.1 prevails. It will be recalled that this occurs in a world of private information where insurers

Figure 10: Actuarially Fair Mandatory Social Security Compared With Private Information Annuities Market (No Quantity Monitoring)



cannot monitor the total annuity quantities that agents purchase. In the absence of social security the annuity price is P*, with a-agents purchasing the contract F and b-agents the contract E. As in Figure 1, a mandatory social security tax of T on the young translates into a pension of $\frac{T}{P^f} = \frac{(1+r)T}{q^f}$ when old. If a social security tax of T' is imposed on all agents, then the residual annuities market disappears and both agents move to the point G. At G, b-agents are better off than at E, while a-agents are as well off. Both agents are better off (and residual annuities markets survive) for $0<T<T'$. Mandatory social security in this range therefore Pareto-dominates the competitive no-social security equilibrium. A social security tax greater than T' makes the a-agents worse off. There will, however, be an additional range of taxes above this level that will still increase social welfare, depending on agent weightings.

Figure 11 shows the welfare effects on each agent in terms of consumer surplus[18]. Each 65 year-old would annuitize all of her wealth if faced with her actuarially-fair price. The shorter the agent's life expectancy, the further to the left is her annuity demand curve for prices above her actuarially fair price. The welfare gain for long life expectancy agents is the large consumer surplus area AFGD. It is unambiguously positive. The welfare gain for average life expectancy agents is the shaded consumer surplus area. It is also unambiguously positive. The welfare gain for short life expectancy agents is the consumer surplus area ABC minus the area CDE. In the case shown, it is positive, but it could be negative for a shorter life expectancy.

The assumption that agents have private longevity information during the first of two discrete periods (young and old) is quite restrictive. It is more realistic to assume that agents gradually acquire private longevity information over their working lives, with new entrants having no private information. At age 18, a new entrant may not know which life expectancy category she will end up in at age 65. If she assumes that she is of average life expectancy then her welfare gain from mandatory social security is the shaded consumer surplus area bounded by the average life expectancy annuity demand curve and the aggregate actuarially fair price shown in Figure 11. Unlike the ambiguous case of 65 year-olds, all new entrants are better off.

Brugiavini (1993) shows that if agents gradually learn their differing longevity risks and there is no income uncertainty then new entrants will lock into actuarially fair annuities with no further purchases made later. Annuities offered to older agents would suffer from adverse selection because private longevity information would have been acquired. However, in practice we do not witness significant private annuity purchases by even new entrants. Brugiavini shows that a combination of lifetime income uncertainty and private longevity information can generate this result. If new entrants are unsure of their lifetime income they will prefer an income contingent annuity contract to

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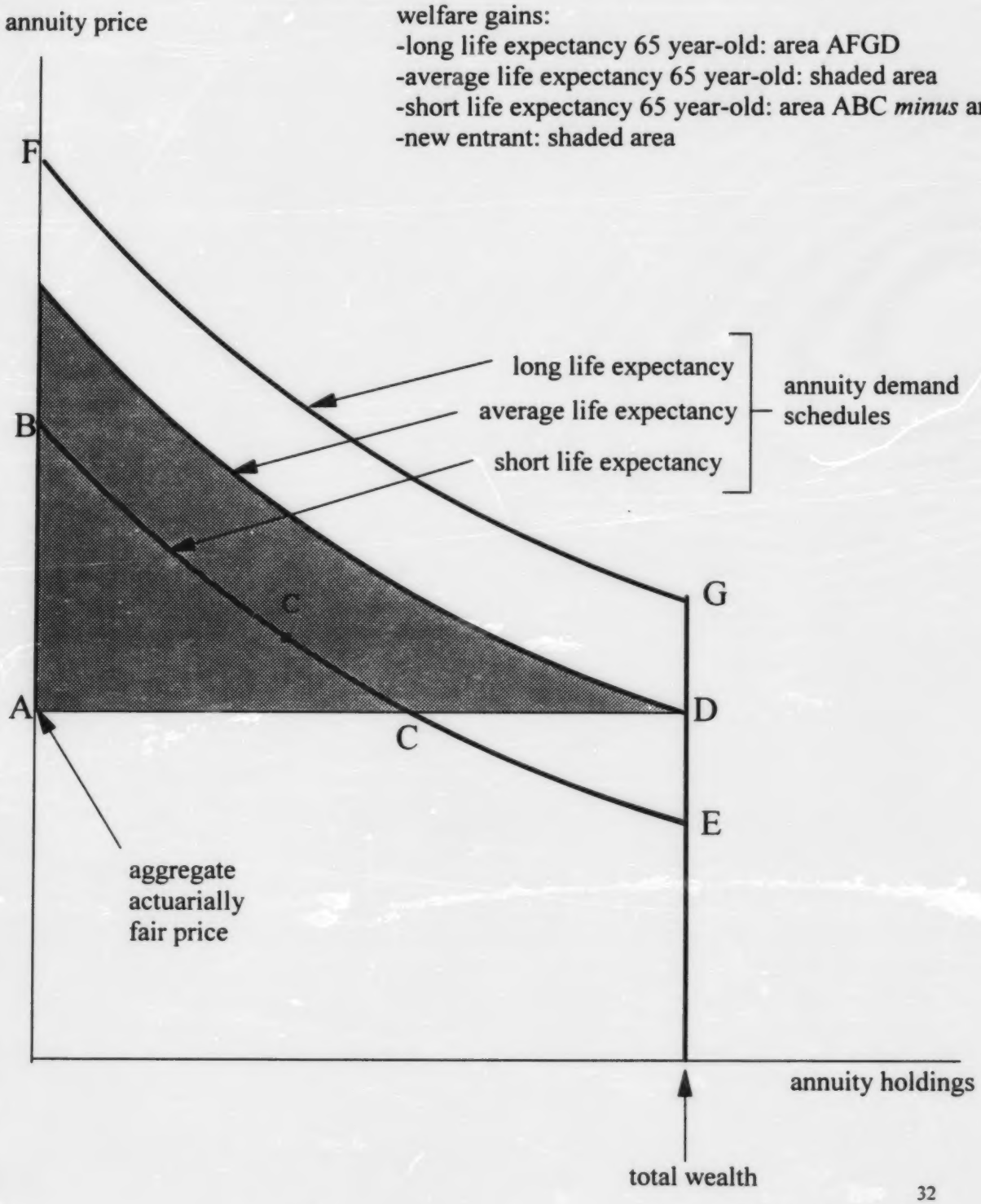
[18] The exposition is based on Townley (1990).

Figure 11: Welfare Gain to 65 Year-Olds
and New Entrants From Mandatory Public Annuitization



an irreversible initial lump sum payment. If individual incomes are not observable and income contingent contracts are not feasible then an annuity market equilibrium may not exist. Firms will be unable to disentangle mid-life recontracting demands based on income from demands based on acquired private longevity information, hence adverse selection will reappear. Brugiavini shows that a mandatory actuarially fair earnings-related pension system has the features of an efficient income contingent annuity contract and can therefore overcome the market failure and provide optimal protection for survival risks.

Eckstein *et al* find that in a world of adverse selection with quantity monitoring, mandatory actuarially fair social security can Pareto dominate a wide class of competitive equilibria. Similar results are found by Boadway and Townley (1988).

Market failures caused by moral hazard problems provide a number of justifications for public social security. A prominent example is the case of disability insurance. Kotlikoff (1987) notes there is essentially no private disability insurance market, with the exception of employer-provided policies. While some disabling medical problems can be easily identified, others (such as chronic back pain) cannot be objectively observed by insurance companies and therefore present problems of moral hazard as well as fraud. He argues that one advantage to government provision of disability insurance relative to private industry is its access to extensive employment information which enables it to more easily determine whether a claimant has returned to work.

As noted previously, the existence of flat benefit and means-tested systems like OAS/GIS can create a moral hazard problem in which individuals save inadequately knowing that they can free ride on these programs. As Blinder notes, however, filialism can generate a similar moral hazard problem even in the absence of such programs:

> Filial devotion creates an externality, for consumption by the old bestows benefits not just on the old, but also on the young. And, as usual, an externality creates a free rider problem with which voluntary exchange through markets cannot cope. In this case, members of each generation know that succeeding generations will care for them in old age if necessary and so have an incentive to undersave.

4.2.3 Increased Efficiency

Diamond (1977) argues that a mandatory public pension system may be significantly more efficient than a private competitive system. He argues that "when selling costs are large and a relatively easy device (payroll tax) for government compulsion is available, having a compulsory program may save a significant portion of the total costs of the product." This is borne out in Table 2, which compares the expenses of Canadian life insurance companies with those of the CPP in 1994.

Life insurance expenses as a percent of premiums were 13.4 times higher than CPP expenses as a per cent of contributions while life insurance expenses per policy were 28.2 times higher than CPP expenses per plan participant (contributors and beneficiaries). Trusteed pension plan expenses per participant were 12.9 times higher than those of the CPP. Diamond (1977; 1993) finds similar ratios of private plan expenses to those of Social Security for the United States.

The existence of fixed costs means that the net marginal cost of moving from a public to a private system would likely be less than the average cost differentials from Table 2. Nevertheless, life insurance commissions, which can be viewed as a per-participant marginal cost, are also well above the CPP costs. Privatization would also lead to some new fixed costs as new occupational plans appeared as agents attempted to fill the gap in their desired annuitization.

Table 2: Canadian Life Insurance and CPP Expenses

	Per cent of premiums	Cost per participant ($)
Life insurance commissions	8.9	158
Life insurance general expenses	16.5	293
Life insurance expenses (total)	25.4	451
Trusteed pension plan expenses (public sector)	4.5	200
Trusteed pension plan expenses (private sector)	8.0	213
Trusteed pension plan expenses (total)	5.7	206
CPP expenses (total)	1.9	16

Sources: Life insurance data: *Summary Financial Data - Life Insurance Companies 1994*, Office of the Superintendent of Financial Institutions; Trusteed pension fund data: *Trusteed Pension Funds - Financial Statistics 1993*, Statistics Canada; CPP data: Canada Pension Plan: Fifteenth Actuarial Report (February 1995)

4.2.4 Public and Occupational Plan Substitutability and Complementarity

Mandatory employer pension plans that force all employees to contribute and to annuitize their share of the pension fund can also overcome the adverse selection problem, and it is for precisely this reason that employees and employers find it in their mutual interest to participate in such plans. Munnell (1982) argues that the simultaneous

growth in U.S. Social Security and occupational pension plans since the Second World War can be explained as society's attempt to close the large gap between actual and desired annuitization. The growth of occupational plans indicates the presence of an annuitization demand in excess of that provided by Social Security.

Munnell notes that occupational plans are in many ways an imperfect substitute for a mandatory public plan. This is because a mandatory public plan achieves the greatest possible actuarial risk pooling, provides for full portability, indexes against inflation, and covers both employees and the self-employed.

The partial substitutability of public and occupational plans means that any phase-out of the CPP would likely lead to increased demand for occupational pensions. This view is supported by the fact that the phase-in of the CPP was accompanied by a marked slowdown in the growth of occupational pensions, and the fact that between 1965 and 1967, an undetermined number of employees who belonged to contributory RPPs' and whose participation was not compulsory, discontinued their membership when the mandatory CPP came into effect. Weitz (1992) notes that this was reflected in higher cash withdrawals during those years.

Figure 12 shows that occupational plan coverage rates tend to be higher in countries with lower maximum public plan[19] replacement rates. The rough relationship is that a 10 point reduction in the maximum public replacement rate corresponds to a 7 point increase in occupational plan coverage. This supports the idea that the demand for occupational coverage is greater, the lower is the public system replacement rate.

Part of the increase in demands on occupational plans resulting from a CPP phase out would occur because of institutional integration with the CPP. The most common form of integration in Canada is through the use of a step-rate formula. Some plans also use direct offset system in which the amount of pension is reduced by a portion of the estimated CPP benefit. Under the step-rate approach, the rate of occupational pension accrual below the CPP's Year's Maximum Pensionable Earnings (YMPE) is less than on earnings above the YMPE. Large public service plans often use a formula in which earnings below the YMPE accrue a pension of 1.3 per cent of final earnings for each year of service, while earnings above the YMPE accrue at a 2.0 per cent rate. The differential of 0.7 per cent is rationalized by the fact that the CPP provides a pension of 25 per cent of final earnings for 35 years of contributions, that is, about 0.7 per cent year[20].

Any decrease in the CPP replacement rate would likely lead to a higher occupational plan accrual rate below the YMPE. Any slowdown in the growth of the YMPE would automatically raise the average accrual rate of occupational plans using the

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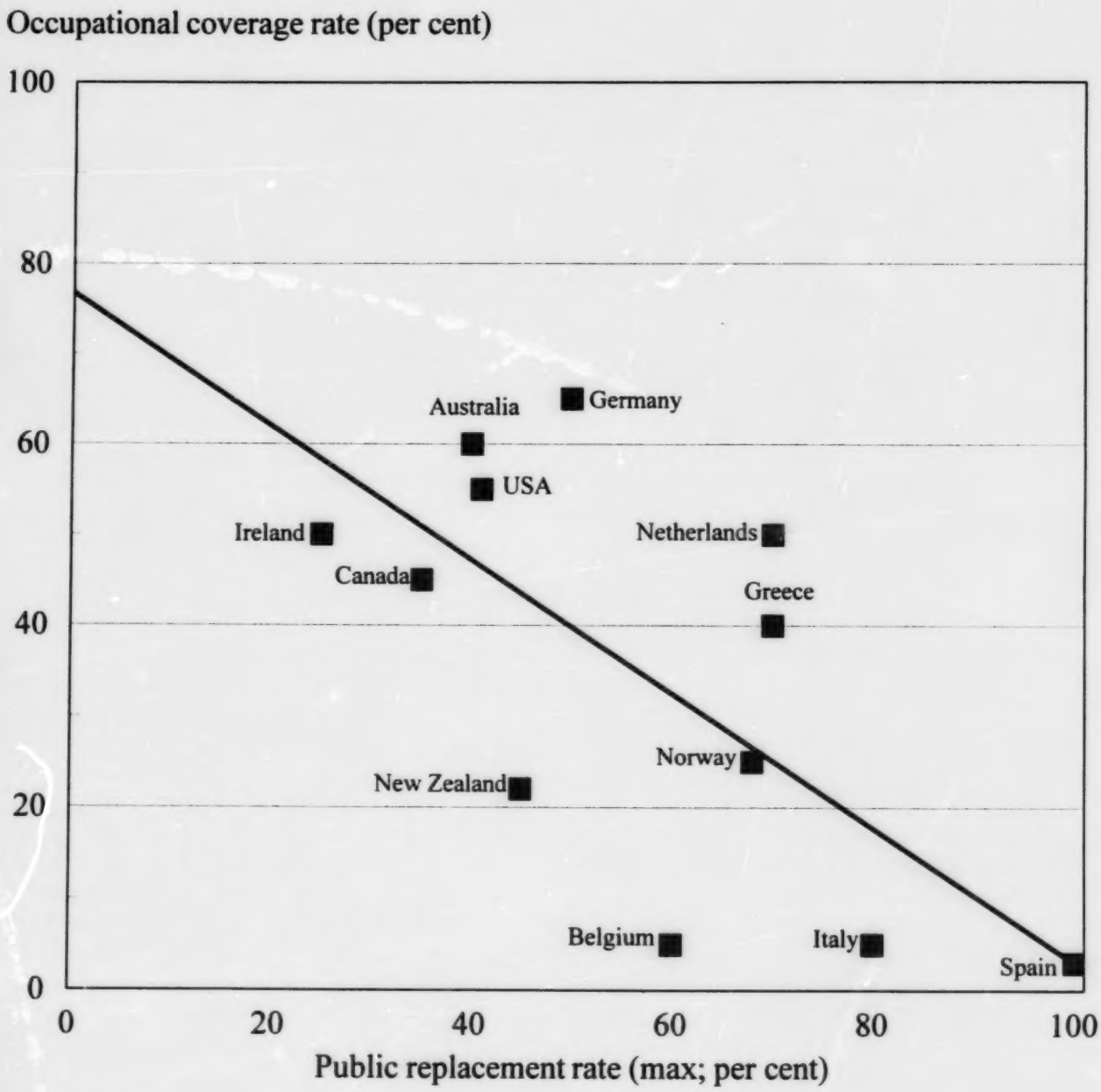
19 "Public" is defined here as earnings based and flat benefit systems combined. Source: *Private Pensions and Public Policy*, OECD (1992)

20 OECD "Private Pensions in O.E.C.D. Countries - Canada" *Social Policy Studies* No. 15 (1995)

Figure 12: Public Replacement Rates and Occupational Coverage Rates



step-rate system. A reduction in the CPP replacement rate during a Plan phase out would therefore create unfunded liabilities for occupational plans, forcing them to raise their contribution rates.

Figure 13 provides a cross-country comparison of maximum public replacement rates and total (occupational plus public) replacement rates for those covered by an occupational plan. The striking feature of this chart is that the total replacement rate is essentially invariant with respect to the maximum public replacement rate. Agents appear to have a desired total replacement rate of about 68 per cent, and those with access to occupational plans are able to achieve it through a combination of integration arrangements and bargaining with employers regarding occupational plan generosity. This does not mean that abolishing public plans would leave individuals no worse off, as occupational plans face higher administrative costs, do not cover all workers, and suffer from incomplete portability. Figure 13 reinforces the message of Figure 12 that agents have a desired level of annuitization, and that public and occupational plans are substitutes, albeit imperfect, in achieving this annuitization.

Merton *et al* (1987) argue that integration provides a way for members of occupational plans to insure themselves against adverse changes in the social security benefits to which they will be entitled. This could help explain the simultaneous growth in U.S. Social Security and occupational plans. It also means that occupational plans are not merely a substitute for a public earnings-based plans, but also a complement.

5. Assessing the Continuum of Retirement Income Systems: A Summary

Table 3 summarizes our qualitative assessment of public and private systems along the retirement system continuum described in Table 1. The main features of each option are given, along with its principal strengths and weaknesses. As one reads down each column, features not present in the preceding option and their corresponding strengths and weaknesses, are italicized. Table 4 provides similar information arranged by individual feature, rather than system option.

All of the public systems provide efficient insurance against longevity risk, universal coverage, portability and low administrative costs. The allocation of day-to-day portfolio management to a number of private fund managers operating at arms length from the government greatly reduces the risks of political interference. Switching to a public defined contribution system further reduces these risks and makes individual pension asset accrual more transparent, but at the price of reduced replacement rate predictability. The quasi-private-public and private (Chilean and World Bank Report) options all suffer from higher administrative costs associated with individual portfolio management. The voluntary purchase of a private annuity feature of the private options eliminates the possibility to efficiently insure against longevity risk. The abolition option of Robson eliminates all political risk but at the price of non-insurance of longevity risk, a possible OAS/GIS free-rider problem that could lower private saving, and increased demands on occupational plans.

Figure 13: Public Replacement Rates and Total Replacement Rates for Those Covered by Occupational Plans

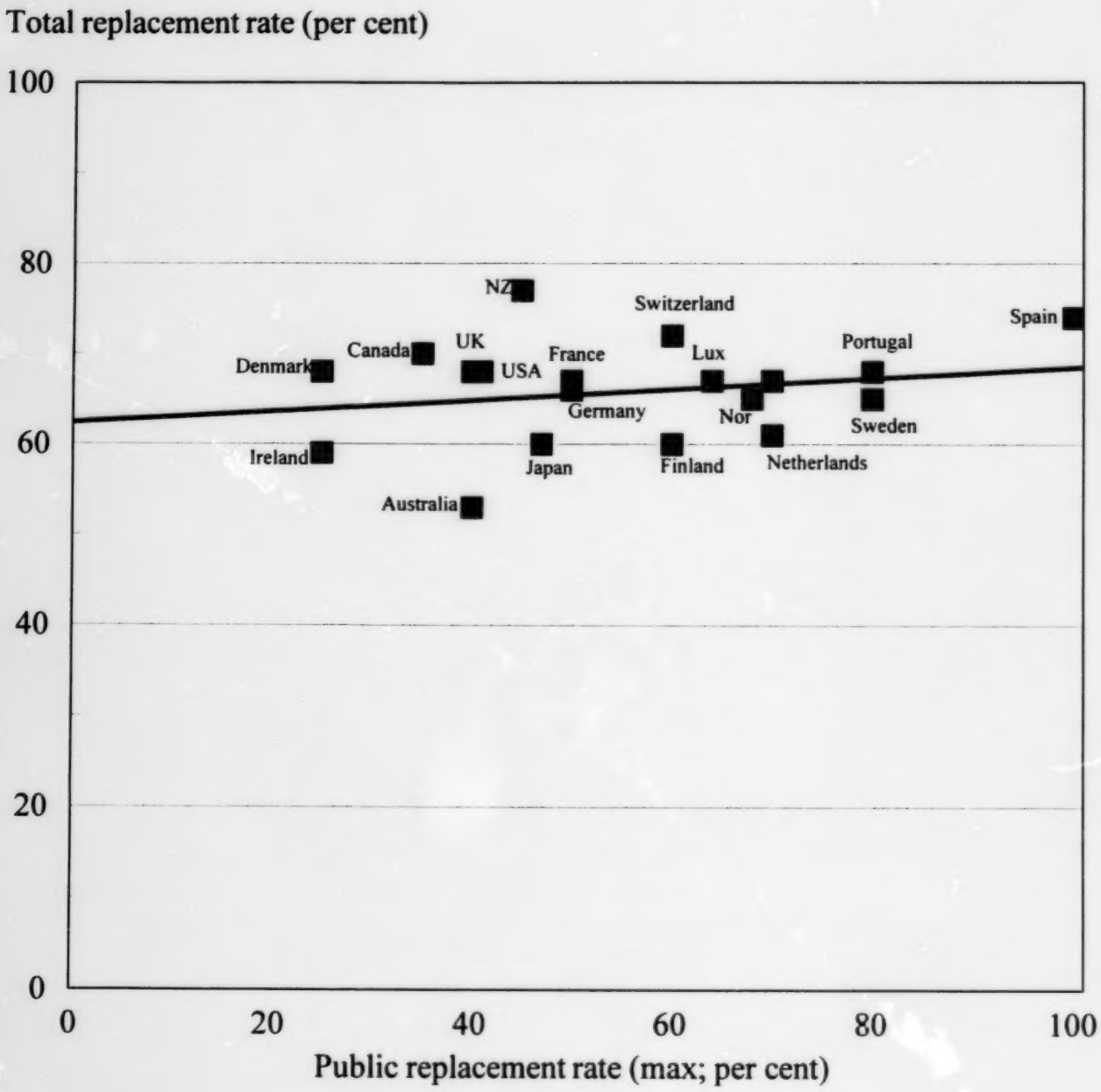


Table 3: Strengths and Weaknesses of Options Along the Retirement System Continuum

Option and Main Features	Strengths	Weaknesses
Current -mandatory saving -near-PAYGO -defined benefit -mandatory annuitization -public annuity	-insures longevity risk -universal -portable -low administrative costs	-worsening intergenerational transfers -unfunded liability reduces national saving -risk of benefit enrichment -pension asset accrual not transparent
Reformed Public (1) -mandatory saving *-fuller funding* -public fund management -defined benefit -mandatory annuitization -public annuity	-insures longevity risk -universal -portable *-reduces intergen. transfers* *-raises national saving* *-enhanced benefit security* -low administrative costs	-risk of fund management political interference - pension asset accrual not transparent
Reformed Public (2) -mandatory saving -fuller funding *-centralized fund, privately managed* -defined benefit -mandatory annuitization -public annuity	-insures longevity risk -universal -portable -enhanced benefit security -reduces intergen. transfers -raises national saving -low administrative costs *-reduces political risk*	- pension asset accrual not transparent
Reformed Public (3) -mandatory saving -fuller funding -centralized fund, privately managed *-defined contribution* -mandatory annuitization -public annuity	-insures longevity risk -universal -portable *-transparent pension asset accrual* -reduces intergen. transfers -raises national saving -low administrative costs -automatic full funding *-minimal political risk*	*-reduced replacement rate predictability*
Quasi-Private-Public (1) -mandatory saving -fuller funding *-individual management* -defined contribution -mandatory annuitization -public annuity	-insures longevity risk -universal -portable -reduces intergen. transfers -raises national saving -transparent pension asset accrual -automatic full funding -minimal political risk	*-high administrative costs* -reduced replacement rate predictability

Table 3: Strengths and Weaknesses of Options Along the Retirement System Continuum

Option and Main Features	Strengths	Weaknesses
Quasi-Private-Public (2) -mandatory saving -fuller funding -individual management -defined contribution *-voluntary annuitization* -public annuity	-insures longevity risk -universal -portable -reduces intergen. transfers -raises national saving -transparent pension asset accrual -automatic full funding -minimal political risk	-high administrative costs *-government deficit on annuity provision* *-higher distorting taxes* -reduces replacement rate predictability
Quasi-Private-Public (3) -mandatory saving -fuller funding -individual management -defined contribution *-mandatory annuitization* *-private annuity*	-insures longevity risk -universal -portable -reduces intergen. transfers -raises national saving -transparent pension asset accrual -automatic full funding -minimal political risk	-high administrative costs *-captive market rents* *-advertising and sales costs* -reduces replacement rate predictability
Private (Chilean) -mandatory saving -fuller funding -individual management -defined contribution -voluntary annuitization *-private annuity*	-universal -portable -reduces intergen. transfers -raises national saving -transparent pension asset accrual -automatic full funding -minimal political risk	*-does not insure longevity risk* -high administrative costs -reduces replacement rate predictability *-constrains efficient annuitization*
World Bank Report -mandatory saving -fuller funding -individual management -defined contribution -voluntary annuitization -private annuity *-choice between mandatory personal and occupational plans*	-universal -portable -reduces intergen. transfers -raises national saving -transparent pension asset accrual -automatic full funding -minimal political risk	-does not insure longevity risk -high administrative costs -reduces replacement rate predictability -constrains efficient annuitization *-eliminates efficient annuitization by occupational plans*
Abolition (Robson) *-voluntary saving* -individual management -voluntary annuitization -private annuity	-reduces intergen. transfers -raises national saving *-no political risk*	-does not insure longevity risk *-moral hazard savings problem* *-increased strain on occupational plans*

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Table 4: Strengths and Weaknesses of Retirement System Features

Option and Main Features	Strengths	Weaknesses
-mandatory saving	-avoids free-rider problem -universal -portable	
-mandatory annuitization +public annuity	-insures longevity risk	
-voluntary annuitization +public annuity	-insures longevity risk	-government deficit on annuity provision -higher distorting taxes
-mandatory annuitization +private annuity	-insures longevity risk	-captive market rents to private insurers -advertising and sales costs
-voluntary annuitization +private annuity		-does not insure longevity risk
-defined benefit	-replacement rate predictability	-pension asset accrual not transparent
-defined contribution	-transparent pension asset accrual -minimal political risk	-reduced replacement rate predictability
-near-PAYGO		-worsening intergenerational transfers -unfunded liability reduces national saving -risk of benefit enrichment
-fuller funding	-reduces intergen. transfers -raises national saving -enhanced benefit security	
-centralized fund, privately managed	-reduced political risk	
-individual management		-high administrative costs
-choice between mandatory personal and occupational plans		-eliminates efficient annuitization by occupational plans
-voluntary saving	-no political risk	-moral hazard savings problem -increased strain on occupational plans

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-voluntary annuitization +private annuity		-does not insure longevity risk
-defined benefit	-replacement rate predictability	-pension asset accrual not transparent
-defined contribution	-transparent pension asset accrual -minimal political risk	-reduced replacement rate predictability
-near-PAYGO		-worsening intergenerational transfers -unfunded liability reduces national saving -risk of benefit enrichment
-fuller funding	-reduces intergen. transfers -raises national saving -enhanced benefit security	
-centralized fund, privately managed	-reduced political risk	
-individual management		-high administrative costs
-choice between mandatory personal and occupational plans		-eliminates efficient annuitization by occupational plans
-voluntary saving	-no political risk	-moral hazard savings problem -increased strain on occupational plans

6. Further Work: Developing a Framework for a Quantitative Assessment

Throughout this paper our assessment of features along the retirement system continuum has been essentially qualitative. In this section we will briefly describe how some of this analysis could be quantified.

The work of Friedman and Warshawsky (1988; 1990) and Abel (1985; 1988) provides a useful theoretical basis for evaluating the welfare effects of a public pension system. Friedman and Warshawsky model the demand for individual life annuities in the context of life-cycle saving and a bequest motive, generalized to incorporate fixed mandatory holdings of publicly provided annuities (pensions). Formally, the individual maximizes expected lifetime utility:

$$E(U) = \sum_{t=0}^{w-x-1} [\frac{p(x)_t U(C_t)}{(1+\rho)^t} + p(x)_t q(x)_{t+1} V(G_{t+1})]$$

where w is the assumed maximum length of life, x is the individual's age as of time t=0, $p(x)_t$ is the probability that an individual aged x at time t=0 will be alive at any time t>0, $q(x)_{t+1}$ is the conditional probability that such an individual who was alive at time t will die at time t+1, C is consumption and G is a bequest. The utility functions have the isoelastic form:

$$U(C_t) = \frac{C_t^{\xi}}{\xi}$$

$$V(G_t) = \frac{G_t^{\xi}}{\xi} b_t$$

where ξ is the Arrow-Pratt coefficient of relative risk aversion, ρ is the rate of time preference and $\frac{b_t}{(1+\rho)^t}$ is the relative utility attached to bequests left in period t. Individuals maximize E(U) subject to initial wealth, a subsequent nonnegativity constraint on wealth and available investment options, including mandatory holdings of publicly provided annuities. Using plausible calibration values, they are able to replicate the fact that few agents purchase private annuities. They are able to attribute this primarily to the actuarially unfair feature of annuities (resulting primarily from adverse selection and transactions costs) with an additional role for a bequest motive.

Abel constructs a theoretical overlapping generations model featuring agents that live either 1 or 2 periods (which is uncertain). His model features accidental bequests and the possibility of different types of bequest motives. The calibration values obtained by Friedman and Warshawsky could be usefully employed in a computable version of Abel's model to determine the quantitative social welfare impacts of the longevity

insurance and reduced intracohort consumption dispersion that public pensions provide, as well as the dynamic precautionary savings effects of eliminating this insurance.

Abel finds that if the real interest rate exceeds the real growth rate and if actuarially fair annuities markets are absent, then introducing fully-funded actuarially fair social security leads to lower bequests, lower national saving[21], higher initial consumption, lower steady-state consumption and reduced intracohort income inequality (which is proportional to bequests). The consumption effects have an ambiguous impact on social welfare, while the reduced inequality raises social welfare.

The effects of the higher administrative costs associated with privatization could also be captured in a CGE framework. Higher administrative costs in a mandatory private system would imply an increased waste of resources as well as higher payroll taxes.

The risk that a fully-funded public system might be subject to politically-motivated benefit enrichments or contribution rate decreases could also be examined using the CGE model. Such a risk amounts to a positive probability that a fully-funded system will gradually become partly funded, or even revert to PAYGO. While CGE simulations cannot tell us what this probability is, they can provide a range of social welfare impacts corresponding to differing degrees of risk.

7. Conclusions

In this paper we have examined a continuum of CPP options ranging from the status quo to outright abolition. This examination has revealed that many of the supposed benefits of privatization such as the asset accrual transparency of individual accounts and reduced economic distortions have, in reality, little to do with the public or private nature of the system, but rather with other characteristics, such as defined benefits versus defined contributions or PAYGO versus fuller funding. This is important, because it means that policy makers can, if they desire, address these issues without privatizing the CPP.

The strongest argument in favour of a private system is that it would be less subject to political risks. There is, however, no guarantee of this. Institutional features could be devised to limit the political risks associated with a more fully funded public CPP, and in privatization options there is always the danger that the extra explicit debt used either to provide recognition bonds or fully fund the system during its gradual phase-out would not be paid down. If the resulting higher future taxes were more distorting than those used to finance the public CPP, privatization could actually end up

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[21] This result is model-dependant. Eckstein *et al* and Sheshinski and Weiss (1981) find that actuarially fair social security may raise national saving. Eichenbaum and Peled (1987) find that the precautionary saving induced by the absence of efficient annuities is excessive in the Paretian sense. See also Davies (1981) and Yagi and Nishigaki (1993) for analyses of the relevance of uncertain lifetimes for precautionary saving.

being more distorting than PAYGO itself. Privatization *per se* does not solve the intergenerational transfer problem created by the CPP unfunded liability. Only tackling that liability directly does so, and that can be as easily done in a public system.

The strongest arguments against private systems are that they fail to insure against longevity risk and are subject to significantly higher administrative costs than public systems. It is well known that adverse selection causes private annuity markets to fail or be inefficient. Mandatory, universal public systems can overcome this problem by efficiently pooling longevity risks over the entire population. RRSPs may be an effective vehicle for retirement saving, but they cannot provide the efficient annuitization of a public pension plan. Data for Canada, the United States and Chile all suggest that private systems are more administratively costly. Higher administrative costs imply wasted resources and reduced social welfare.

Cross-country evidence combined with significant occupational pension demand suggest that it is unlikely that Canada's public system is over-annuitizing worker wealth. Extensive private options already exist, including significant scope for tax-sheltering of retirement saving.

On balance, the evidence suggests that the potential gains from privatization are significantly outweighed by the potential costs. Any flaws in the CPP can and should be addressed within the framework of a continued public system.

Bibliography

Aaron, H., *Economic Effects of Social Security* (1982)

Abel, A., "Bequests and Social Security With Uncertain Lifetimes," NBER Working Paper no. 1372 (1984)

Abel A., "Precautionary Saving and Accidental Bequests, *American Economic Review*, vol. 75, no. 4 (Sept. 1985)

Abel, A., "The Implications of Insurance for the Efficacy of Fiscal Policy," NBER Working Paper no. 2517 (Feb. 1988)

Abel, A. and M. Warshawsky, "Specification of the Joy of Giving: Insights From Altruism," *Review of Economics and Statistics* (1988)

Barr, N., "Economic Theory and the Welfare State: A Survey and Interpretation," *Journal of Economic Literature* (June 1992)

Blinder, A., "Why is the Government in the Pension Business?" in *Social Security and Private Pension*, ed. S. Wachter (1988)

Boadway, R., and P. Townley, "Social Security and the Failure of Annuity Markets," *Journal of Public Economics*, no. 35 (1988)

Bodie, Z., A.J. Marcus and R.C. Merton, "Defined Benefit versus Defined Contribution Plans: What are the Real Trade-offs?" in *Pensions in the U.S. Economy*, eds. Z. Bodie and J.B. Shoven (1988)

Bodie, Z., "Pensions as Retirement Income Insurance," NBER Working Paper no., 2917 (1989)

Boskin, M., L. Kotlikoff and J. Shoven, "Personal Security Accounts: A Proposal for Fundamental Social Security Reform" in *Social Security and Private Pensions* (1988)

Brugiavini, A., "Uncertainty Resolution and the Timing of Annuity Purchases," *Journal of Public Economics*, vol. 50, no. 1 (Jan. 1993)

Davies, J., "Uncertain Lifetime, Consumption, and Dissaving in Retirement," *Journal of Political Economy*, vol. 89, no. 3 (1981)

Delaney, T., *The Delaney Report on RRSPs* (1992)

Diamond, P., "A Framework for Social Security Analysis," *Journal of Public Economics* no. 8 (1977)

Diamond, P., "Privatization of Social Security: Lessons From Chile" NBER Working Paper No. 4510 (Oct., 1993)

Diamond, P., "Public Provision of Pensions," *Canadian Public Policy*, (March 1996)

Eichenbaum, M., and D. Peled, "Capital Accumulation and Annuities in an Adverse Selection Economy," *Journal of Political Economy*, vol. 95, no. 2 (1987)

Eckstein, Z., M. Eichenbaum and D. Peled, "Uncertain Lifetimes and the Welfare Enhancing Properties of Annuity Markets and Social Security," *Journal of Public Economics*, no. 26 (1985)

Feldstein, M., "Would Privatizing Social Security Raise Economic Welfare?" NBER Working Paper no. 5281, (1995)

Feldstein, M., "The Missing Piece in Policy Analysis: Social Security Reform" *American Economic Review* (May 1996)

Ferrara, P., "Social Security: The Inherent Contradiction," Cato Institute (1980)

Friedman, B., and M. Warshawsky, "Annuity Prices and Saving Behaviour in the United States," in Z. Bodie, J. Shoven and D. Wise eds., *Issues in Pension Economics* (1987)

Friedman, B., and M. Warshawsky, "The Cost of Annuities: Implications for Saving Behaviour and Bequests," *Quarterly Journal of Economics* (February, 1990)

Gramlich, E., "Different Approaches for Dealing with Social Security," *American Economic Review* (May 1996)

James, S., C. Matier, H. Sakhnini and M. Sheikh, "The Economics of Canada Pension Plan Reforms," Department of Finance Working Paper 95-09 (November, 1995)

Kotlikoff, L., "Justifying Public Provision of Social Security," *Journal of Policy Analysis and Management*, Vol.6, No.4 (1987)

Kotlikoff, L.,"Privatization of Social Security: How It Works and Why It Matters" (1995)

Kotlikoff, L.,"Privatizing Social Security at Home and Abroad," *American Economic Review* (May 1996)

Kruse, D., "Pension Substitution in the 1980s: Why the Shift Toward Defined Contribution Plans?" NBER Working Paper no. 3882 (1991)

Merton, R., Z. Bodie, and A. Marcus, "Pension Plan Integration As Insurance Against Social Security Risk," in Z. Bodie, J. Shoven and D. Wise eds., *Issues in Pension Economics* (1987)

Mitchell, O. and Zeldes, S., "Social Security Privatization: A Structure For Analysis," *American Economic Review* (May 1996)

Munnell, A., *The Economics of Private Pension Plans* (1982)

OECD, *Private Pensions and Public Policy* (1992)

OECD, "Private Pensions in O.E.C.D. Countries - Canada" *Social Policy Studies* No. 15 (1995)

Pedoe, A., and C. Jack, *Life Insurance, Annuities and Pensions* (1974)

Power, S. and Townley, P., "The Impact of Government Social Security Payments on the Annuity Market," *Journal of Insurance: Mathematics and Economics*, 12 (1993)

Robson, W., "Putting Some Gold in the Golden Years: Fixing the Canada Pension Plan," C.D. Howe Institute Commentary (1996)

Rothschild, M. and J. Stiglitz, "Equilibrium in Competitive Insurance Markets: An Essay On the Economics of Imperfect Information," *Quarterly Journal of Economics* (Nov. 1976)

Sheshinski, E. and Y. Weiss, "Uncertainty and Optimal Social Security Systems,"*Quarterly Journal of Economics* (May 1981)

Strawczynski, M., "Income Uncertainty, Bequests and Annuities," *Economic Letters* (March 1993)

Townley, P., "Life-Insured Annuities: Market Failure and Policy Dilemma," *Canadian Journal of Economics* (August 1990)

Warshawsky, M., "Private Annuity Markets in the United States: 1919-1984," *Journal of Risk and Insurance* (September 1988)

Weitz, H., *The Pension Promise: The Past and Future of Canada's Private Pension System* (1992)

Yagi, T., and Y. Nishigaki, "The Ineffiency of Private Constant Annuities," *Journal of Risk and Insurance* (1993), vol. 60, no. 3

World Bank, *Averting the Old Age Crisis* (1994)

Appendix - Annuities and Phased Withdrawals: Formal Analysis

Let $q_t(j,x)$ denote the probability at time zero that an aged x individual j will be alive at any time t>0, w be the maximum length of life, and r be the real interest rate. The actuarially fair price for this individual $p_t^a(x)$ will then be given by:

$$p^a(j,x) = \sum_{t=0}^{w-x-1} \frac{q_t(j,x)}{(1+r)^t}$$

A longer life expectancy implies a higher series of q values, and therefore a higher actuarially fair price. The aggregate actuarially fair price for individuals aged x, $P(x)^a$, is the average of all the individual actuarially fair prices:

$$P^a(x) = \sum_{j=0}^{J} \frac{p_t^a(j,x)}{J}$$

Suppose that the actual annuity price is $P(x)$, which may be greater than $P^a(x)$. If an agent converts $P(x)$ dollars into a series of equal payments over K periods (e.g.: a RRIF), then each payment Y will have a value:

$$Y = \frac{P(x)}{\sum_{t=0}^{K} \frac{1}{(1+r)^t}}; 0 < K \leq w - x - 1$$

The expected value (accounting for longevity risk) of the stream of RRIF payments will be:

$$W = P(x) \frac{\sum_{t=0}^{K} \frac{q_t(j,x)}{(1+r)^t}}{\sum_{t=0}^{K} \frac{1}{(1+r)^t}}$$

Now,

$$\sum_{t=0}^{K} \frac{q_t(j,x)}{(1+r)^t} < \sum_{t=0}^{K} \frac{1}{(1+r)^t}$$

The load factor, L(j,x), is defined as:

$$L(j,x) = P(x) - p^a(j,x)$$

If the load factor is zero, then the annuity is actuarially fair, and:

$$W < p^a(j,x)$$

so the annuity raises the agent's consumption possibilities relative to a RRIF. If the agent has no bequest motive, she will annuitize all of her wealth. Positive load factors that satisfy:

$$0 < L(j,x) < P(x)\left[1 - \frac{\sum_{t=0}^{K} \frac{q_t(j,x)}{(1+r)^t}}{\sum_{t=0}^{K} \frac{1}{(1+r)^t}}\right]$$

also imply increased consumption possibilities, although the degree of annuitization in this case will depend upon the extent of a bequest motive. Observed load factors are generally in this range.

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